EDUCATION.

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MORAL INSTRUCTION IN THE PENITENTIARY.

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The separation of the Christian from the criminal class of the community is most marked. Few are the prison convicts who have been trained under the influence of the church, and fewer still are those who were born and bred in Christian families. Of the four hundred and eighty-nine convicts confined, according to late reports, in the Iowa State prison, three hundred and seventy-five have received no religious education, and fifty-three, of the one hundred and fourteen who have received any, were trained in the Catholic faith. Of the five hundred and fifty-six inmates of the penitentiary of Eastern Pennsylvania, three hundred and eleven have never attended Sabbath-school, and of the two hundred and forty-five who have been in attendance, many cannot repeat the Lord's Prayer, or tell where it may be found. Only seven of the four hundred and eight inmates of the Michigan prison have been regular attendants at Sabbath-school, only fifty-four irregular, and three hundred and eighty-four, over eighty-four per cent., have never attended at all. Twenty-two have been regular worshippers at church, one hundred and sixty-one irregular, and two hundred and twenty-two, over fifty-four per cent., have *never* been present at a church-service. In the prison of the State of Illinois are fifteen hundred and forty-seven convicts. Five hundred and twenty-two have a religious belief, three hundred being Catholics. But a thousand and twenty-five possess no religious convictions whatever.

From these statistics it becomes evident that Christianity has exerted a very slight degree of direct influence upon the lives of those who are criminals of the State prison. The church-service has not attracted them. The mission Sunday-school has failed to gather them into its

classes. The training of home has usually been, if not irreligious, at least unmoral, even if not immoral. That so small a proportion of those who have been trained under Christian influences have fallen into crime is a crown of glory to Christianity; and a crown to which public attention ought at present to be directed. But the fact that at least one-half of the convicts in the penitentiaries of the United States have never received any religious education proves how utterly useless and void are many of the efforts of the church for the education and evangelization of the criminal classes of the city and country.

It is, therefore, only after their entrance to the prison that many malefactors receive their first religious instruction. The moral and Christian atmosphere of the penitentiary which, so far as not a few of the officers are concerned, surround the prisoners is very pervasive. Nearly every one of the forty-three penitentiaries in the United States has its chaplain, whose only duty is to care for, in the most comprehensive sense, the religious and moral welfare of the prisoners. He is a Protestant usually, without positively sectarian associations, elected by the overseers of the prison or appointed by the governor of the State, and is paid a regular salary for his services. His duties relate chiefly to the night-school, the library, the Sunday services of preaching and of the Sabbath-school, and also to personal conversation with the convicts upon religious topics.

About fifteen per cent. of the criminals received at the State prisons can neither read nor write. (In many States the rate is larger,—in very few smaller.) Such are, upon their entrance, placed in the prison school if one is established. According to late data the prisons of thirteen States give regular instruction to their inmates: Massachusetts, New Hampshire, Rhode Island, New York, Pennsylvania, Illinois, Indiana, Kentucky, Wisconsin, Iowa, Kansas, California, and Oregon. The course of study is elementary, embracing reading, writing, spelling, arithmetic, with occasionally a brief study of the history or constitution of the United States. Six grades or classes are usually organized, each of which meets in the prison school-room two hours of a single evening of the week. The attendance of the illiterate is compulsory, but the chaplain of the Kansas penitentiary writes that "the majority appreciate the privilege and attend cheerfully." The intellectual and moral results of the work of the school are very marked. "The men generally manifest an eagerness to learn," says the chaplain of the Iowa prison, "and a degree of diligence and patience in applying themselves which is very satisfactory, and in some cases very surprising." The teacher, too, in the penitentiary of Western Pennsylvania writes with

"overwhelming conviction of the value of a first-class, well-furnished school in every reformatory and prison." There are, however, over a score of prisons in the country that make no provision for the regular instruction of their inmates. But every argument that sustains the public school system of the State applies with equal, if not with greater, force to the establishment of schools in every prison.

A second means of moral and religious education with which prisons are furnished is comprised in their libraries and newspapers. To the prisoner alone at night in his cell a book is not merely an entertaining companion: it may prove to be the agent of his reformation or regeneration. "It throws a charm around many a weary hour," says a chaplain, "which otherwise would be burdened with morbid thought and feeling which engender evil restlessness." At the present time there are thirty-five prison libraries in the United States, containing on an average fifteen hundred volumes each. Among the largest and best managed are those of the two penitentiaries of Pennsylvania. That of the Eastern district contains over 7,000 volumes, 658 of which are classed as "religious," 1,476 as "instructive," and 4,130 as "entertaining." It also has a thousand volumes in French, German, and other foreign languages. The degree to which these works are read is indicated in the fact that each prisoner received, on an average, seventy volumes during one year, or nearly six every month. The library of the penitentiary of Western Pennsylvania is somewhat smaller, but in respect to management and efficiency is justly renowned. Of its 4,200 volumes there were in the last year over 35,000 deliverances at the cells. Their character was as follows:

History,	2,668	Science,	1,383
Biography,	3,068	Poetry,	748
Miscellany,	5,005	Travels,	2,677
Novels,	12,920	Magazines,	3,596
Morals,	1,466	German,	1,542

Seven hundred and fifty newspapers were also distributed each week in the corridors of the prison, — the result of either gift or of the subscription of the individual convicts. Four thousand are also annually given by the editors of the religious weeklies of Pittsburgh. But few prisons, however, are so well supplied with books and papers as those of Pennsylvania, yet the Illinois penitentiary has 6,000 volumes, those of Iowa 1,500 and 400 each, the Kansas prison 2,000, with 125 weekly papers; but several prisons have no libraries worthy of the name.

The beneficial effect of the reading of books and newspapers on

the mental and moral habits of prisoners is, so far as I can discover, recognized by all the prison officers of the country. A chaplain has lately remarked, that "to make a prisoner's mind a blank cannot contribute to his permanent reformation. If the daily journal is perused with profit within the sacred precincts of a well-regulated family circle, the same results may accrue in some measure to the prisoner in his loneliness. . . . . When a man will relinquish the use of tobacco in order to get a weekly paper there are many sedate people who will say, here is real reformation."

The only objection that can be urged against allowing convicts these library privileges is that of luxury and leniency. Spending an evening in the reading of Scott or Macaulay is not punishment. But the objection overlooks the chief aim of imprisonment, the reformation of the prisoner. And a more effective reformer than parts of Waverly and of the great Whig historian's England, for many minds, it would be difficult to find. Ignorance and "dime novels" lead many into crime. Intelligence and novels of high character may lead many into penitence and reformation.

Although only about one half of the State penitentiaries contain a secular school and a library, yet every one, so far as I am aware, offers religious services to its inmates on the Sabbath. These services usually embrace either one or two sermons, with accompanying devotional exercises and a Sabbath-school. To the preaching service attendance is commonly compulsory. The sermon seldom contains sectarian elements, and its aim is to be Christian in the broadest sense. "It is my purpose," writes the chaplain of the Connecticut prison, "not to labor to convert the prisoner to any particular creed, but to insist on the regeneration of the heart through the Holy Spirit as the basis of all true and lasting reformation." "I have so wholly ignored," writes Chaplain Williams of the Iowa penitentiary, "the doctrinal non-essentials with regard to which evangelical Christians differ, that most of the convicts are without any knowledge or thought as to the denomination to which their chaplain personally belongs." These remarks are in general true of all prisons. But in those prisons in which a considerable proportion of the inmates are Catholics, the service of a Sabbath is occasionally conducted by the priest of the town in which the prison is located. The Sabbath-school does not differ in essential respects from any Sabbath-school. The "International Series of Lessons" is followed; and teachers for the classes are provided by the churches of the town.

To his duties as a preacher and superintendent of the Sabbath-school, the chaplain adds that of pastor of the prisoners. He is the moral and

religious counsellor of the convicts. "Visiting from cell to cell, giving words of comfort to the broken in heart, . . . encouraging those who are trying to be pious, and also exhorting the ungodly to give up their sinful ways," compose his duties of an evening.

The result of these various moral and Christian influences upon the character of the prisoners is most potent. In regard to susceptibility to religious impressions, those inside of prison walls differ as essentially as those without. Though, therefore, the hearts of some convicts are adamant, the natures of others are as tender as a child's to all ennobling influences. "Many are earnest seekers of salvation from sin," writes Chaplain Briscoe of his fifteen hundred prisoners "and not a few have truly learned to love the Saviour of our ruined race." Among the residents of the Minnesota prison a "prayer-hour" is organized, comprising eighteen members; and "we have quite a number among us," says the chaplain, "who give evidence of the development of Christian character, and express an abiding determination to return to a life of virtue and honor." The convicts of the Tennessee penitentiary, also, have formed a "Christian association," numbering seventy-five. A prayer-meeting is held each Sunday evening, led by one of the members; and it is said that the "remarks and prayers often evince no ordinary degree of Christian intelligence." So, therefore, to at least a few prisoners, the penitentiary is, as the name indicates, a place of penitence.

The question still remains for consideration, of the methods by which the moral and religious influences of the penitentiary may be advanced. It is evident that the various methods which are at present in operation should be continued; and that prisons not possessing schools, libraries, and efficient chaplains should be at once supplied with these agencies of reformation. But one or two additional methods may be suggested, the adoption of which would greatly ennoble the moral and Christian condition of prisoners.

First: The selection of the warden and his subordinates should be determined not merely by their executive and business abilities, but also by reason of the elevation of their *character*. Officers appointed on moral or religious grounds will regard their position not as that of a mere *keeper*, but as one of instruction and friendship, whose primary purpose is to free the criminal from slavery to wrong.

Second: The separation of the hardened criminals from the novices in crime should be made an invariable practice. The boy of fifteen, confined for larceny, should not be permitted to associate with the professional burglar. One-third of the prisoners in the Eastern Pennsylvania penitentiary declare that evil association was the cause of

their crime. In the prison the influence of association is still potent. Those, therefore, who are confirmed in their vices and crimes should be kept entirely apart from those who have just entered upon evil courses. In those States having two or more prisons it would be well to sentence criminals on this principle: allotting the more obdurate to one, and those of whose reformation there is more promise to the other, prison.

HIGHER EDUCATION OF WOMAN IN CAMBRIDGE, ENG.

BY SARAH K. BOLTON.

FORMERLY people went to Cambridge to look with reverence upon the beautiful buildings where Bacon and Milton gained inspiration, and where Newton, Pitt, Byron, and Macaulay walked in ivy-covered courts and under the shade of majestic limes. Now they go for an additional reason: to see what one of the grandest institutions of the world is doing for the higher education of woman.

This is a comparatively new matter. True, America has built three colleges for women, — Vassar, Wellesley, and Smith, — and of its more than 300 colleges, over 170 admit both sexes on equal terms. True, Maria Bassi so distinguished herself in mathematics and classics as to become a professor in the University of Bologna. Elizabeth Carter, of England, was a thorough Greek, Latin, and Hebrew scholar, besides understanding Italian, Spanish, German, French, Portuguese, and Arabic. The great Johnson said, speaking of a celebrated scholar, that "he understood Greek better than any one he had ever known except Mrs. Carter." Her brother wrote to her that he had translated one of the odes of Horace so well that it was supposed to be her work. Her translation of Epictetus won her fame and fortune. Caroline Herschel announced the discovery of eight comets, five of which were unquestionably first seen by her.

Lady Jane Grey wrote and spoke, with the greatest facility and correctness, Latin, Greek, Italian, and French, and was also versed in Hebrew, Chaldee, and Arabic. Queen Elizabeth spoke Latin easily, and was a fine Greek scholar. Dora D'Istria, it is stated, speaks sixteen languages, and is one of the most learned women of the age. And yet the world has been wont to argue as did a gentleman at Berlin last summer, who, when asked if the University would probably ever admit women, replied, "No, madam. If that should happen, every student would leave immediately. Besides, how can a woman need Greek or geometry in taking care of a house and a baby?" This is what Sir Alexander Grant, principal of Edinburgh University, well calls the "great button and slipper argument," where, "if a woman were once permitted to know Greek plays or astronomy, or, in short, to nibble at any side of the apple of knowledge, there would be an end to her sewing on buttons or working slippers. The conclusion was indeed terrific."

When the mother of King Henry VII. founded Christ's College,

and St. Johns at Cambridge; Margaret of Anjou, wife of Henry VI., Queens; Mary, wife of the Earl of Pembroke, Pembroke; and Elizabeth, sister of the Earl of Gloucester, Clare College; it probably never occurred to them that women wielding an important influence, would use it more nobly if educated than if ignorant.

In the last fifteen or twenty years, woman's education, with consequent opportunities for labor in industrial and professional life, has been one of the living questions. In England the matter became prominent in the general movement for a better education for the whole people. Twelve years ago the reports of a royal commission, appointed to inquire into general education, showed the condition of girls' schools to be lamentable. A large number of the teachers were unfitted for their work through ignorance. Girls were "finished" at fifteen or sixteen, with a smattering of French, music, water-colors, and worsted-work. Thackeray said, "When I see two kind, innocent, fresh-cheeked young women go to the piano and sit down opposite to it upon two chairs and go through a set of double-barreled variations upon this or that tune by Herr or Kalkbrenner, far from receiving any satisfaction at the noise made by the performance, my too susceptible heart is bleeding for the performers. What hours and weeks, nay, preparatory years, of study has that jingle cost!"

"Lady-like manners and deportment are far more important than learning," said one of the governesses. In the report made by J. G. Fitch, Esq., Her Majesty's inspector of schools, and one of the governing body at Girton College,—than whom woman's higher education has had no more efficient and devoted advocate,—after speaking of the indifference of parents to the mental cultivation of their daughters, he says: "They will not recognize the plain facts of life,—that women, who have more leisure than men, have it in their power to make, even unconsciously, the noblest use of any culture they possess; and that every sensible man who now marries with a reasonable prospect of happiness, would have a still better prospect of it, if his wife could share his highest intellectual pursuits. . . . The true measure of a woman's right to knowledge is her capacity for receiving it, and not any theories of ours as to what she is fit for, or what she is likely to make of it."

Sometime previously, memorials had been sent by leading men and women to the Universities at Cambridge and Oxford, asking that the "local examinations," which had been already established as a test of and stimulus for scholarship, might be opened to girls.

This was granted to girls not over eighteen, though, says Rev. J. Llewelyn Davies, "with a good deal of trepidation in many minds as

to what might happen. It was feared that they might be made ill, or that the domestic bloom would be rubbed off their minds."

Another memorial was sent in 1868, asking that young women *over* eighteen be admitted to examinations, which was granted also. So persevering is the sex that a half-way measure is not long retained. Higher education necessitated higher instruction. It was felt that, as a guarantee of a solid education, the examinations and course of study for women must be identical with those of men. Therefore, what is now Girton College was begun at Hitchen in 1869 with six students; Miss Emily Davies, one of the most devoted and successful workers for higher education, being at its head. At the end of the year, five young ladies passed the "previous examination," euphoniously called the "little go" in the classic language of college-life, this being the first University examination taken after the student has been in college a year.

In 1873 a three-story, red brick building was erected in the French chateau style, costing over $100,000, two miles from Cambridge, and the college at Hitchen transferred to the new apartments. Miss Bernard, the mistress, gave cordial welcome to my friend and myself on our visit, showing us over the tasteful rooms, painted in terra-cotta red or blue green, and dainty with embroideries in sunflowers and daisies, or prettily arranged peacock-feathers. Each of the fifty-six students has two rooms. There are also in the building eight lecture-rooms, a dining-hall with long tables, and a prayer-room, with laboratory and gymnasium adjoining. The rooms are without gas, lamps or candles being used, — the latter usually preferred. The outlook from the broad windows upon the velvet lawn and cricket grounds is restful and attractive. Mary Somerville's mathematical library, with a bust of the sweet-faced, gifted woman, is an inspiration. One room has many interesting Roman relics, dug up from the adjacent grounds, which must have been an old cemetery. A fine stone lion was probably on one of the tombs.

The students are rarely received before the age of eighteen, and must pass an entrance examination in arithmetic, grammar, physical and political geography, English history, composition, Scripture history, unless objection is made, and in two of the following subjects, one being a language: Latin (easy translation into English or *vice versa*); Greek, the same; French, German, algebra, three books of Euclid, trigonometry, and conic sections. Admission to Wellesley and Smith calls for four or five books in Anabasis and Homer, and four, six, and seven books in Cæsar, Virgil, and Cicero respectively.

The course requires about three years, half of which time, in terms

of about eight weeks each, is spent at the college. The charge for board, lodging, and instruction is about $500 yearly. The teaching is given by lectures, with, of course, no system of marking at recitations, and yet students often ask as well as answer questions. After prayers, breakfast is served at quarter-past 8, lunch from 12 to 3, and dinner at 6, with tea and bread and butter in the rooms at 5 and 9 in the evening. The college gates are closed at 6 in winter and at dusk in summer. Students are required to be present three times a day at marking, and are not at liberty to pay visits to each other's rooms without permission.

These rules are, perhaps, not more stringent than those in the men's colleges, where, in some, the students are subjected to a slight fine if out after ten at night; are "gated," — that is, not allowed to go outside the gates if they are disobedient, — and are looked after tenderly at night by proctors, who are always followed by two tall men, in voluminous gowns with gilt buttons, called by the respectful name of "bulldogs." The central idea of an English University is that of a family relation between students and tutors rather than the freedom of the French or German systems.

Girton has several scholarships. The number of students who have been in residence since its commencement is 118, of whom thirty-eight have obtained honors, twelve in mathematics, twelve in classics, six in moral science, six in natural science, one in history, and sixteen have taken the B.A. or pass degree. The latter requires an examination in the Acts of the Apostles in Greek, in one of the Latin classics, one of Greek; algebra, not beyond equations of the second degree, with proofs of the rules of arithmetical and geometrical progression; elementary statistics and hydrostatics; one or more passages of English put into Latin verse; questions on some play of Shakespeare or work of Milton, with an English essay.

Mr. W. Hazeltine, in his "British and American Education," says, "A Harvard degree means more than a pass-man's certificate at an English University," but that a first-class in honors "represents considerably more, both as regards comprehensiveness and thoroughness, than the maximum attainments in the same direction at present secured by the most studious Harvard undergraduates."

One Girton student stood eighth *wrangler* in the first class in mathematics, another lady being also in the first class; and as the examination for this tripos requires six hours daily for nine days, the standard of scholarship may easily be imagined. Mr. Everett, in "On the Cam," says, "The last five days *begin* with the differential calculus and go up to the highest calculation of astronomy and

optics." A few of the requirements are Rigid Dynamics, Spherical Astronomy, Finite Differences, Newton's Principia, Lunar and Planetary Theories, Hydrodynamics, Elastic Solids, Expression of Functions by Series or Integrals involving sines or cosines, Thermodynamics, Electricity, and Magnetism.

The term "wrangler" comes from the early days when the candidates for honors maintained in public some mathematical thesis, about which they disputed in Latin, the disputants being called wranglers. The word "tripos," says Mr. Bristed, in his "Five Years in an English University," is supposed to refer to the three-legged stool formerly used at the examination for these honors, though some derive it from the three brackets formerly printed on the back of the paper.

One lady has stood in the first class in moral science; another is studying for honors in theology, and some have taken the law special for their final examination. No woman in England, we believe, can become a lawyer as yet, as Americans understand that term; but she may be a conveyancer. Girton impressed us as being an admirable institution, sending out thorough scholars, who receive exactly the same education and are subjected to exactly the same examinations as the University young men. There will always be fine positions open to women educated to this standard, concerning whose ability there can be no question.

Meantime there had been earnest work in another quarter of the kingdom. At Liverpool, in 1867, Miss Clough, the sister of Arthur Hugh Clough, the poet, assisted by Miss Calder, had started lectures for women in that city and in other places. They worked wisely and very successfully, forming a "North of England Council for Women." The first course was in history. Cambridge professors often gave the lectures, and finally the idea naturally suggested itself that women might as well go to Cambridge and hear the lectures on their own ground. Into this project many of the most prominent professors entered heartily. Professor Adams, the very able astronomer who discovered Neptune at the same time with Leverrier, kindly accepted the presidency of an "Association for Promoting the Higher Education of Woman in Cambridge." A house was rented in 1871 for the reception of those who desired to come to Cambridge for lectures, and a system of "Correspondence Lectures" was arranged, not unlike that in Boston, of which society Miss Ticknor is secretary.

Miss Clough was naturally selected as the proper person to be at the head of the new enterprise, and soon, the house becoming full, Newnham Hall, now called South Hall, was built, and opened in 1875.

This, too, becoming crowded, a similar building was erected across the street, called North Hall, and both together constitute Newnham College. We were fortunate in spending a few days with the seventy students gathered there, and happier, more refined, young women we have not been privileged to meet. The white-haired principal, Miss Clough, seems to be universally loved, and she certainly cares for the students as though they were her children.

Both houses are of red brick, in the Queen Anne style, costing about $60,000 each, and surrounded by grounds of two and one-half acres each. South Hall is already partially covered with ivy, and in these early December days the jessamine-vines climbing up its sides were a mass of yellow blossoms. Sweet-scented violets were gathered from the flower-beds, and the chrysanthemums were rich in color. The interior, painted mostly in cool tints of blue, green, or light red; the windows hung with rich, dark drapings; the cheerful open grates; the large writing-table in each room, covered with books; the tasteful fancy articles that bespeak the delicacy of womanhood, — all make a very inviting college home. Such books as Spencer's Data of Ethics, Walker's Money, Plato's Republic, Kant's Philosophy, Mill's Logic, Bacon's Novum Organum, Aristotle, and Locke lay side by side on the student's table with a bunch of pretty flowers and a bit of embroidery only half-completed as yet. Evidently the old idea that Greek, mathematics, and science would make men out of women has found complete refutation at Cambridge.

Each student has one room, the bed being separated from the study by tasteful draperies. The cost of tuition, board, and lodging is a little less than $400 yearly. Women may not enter under eighteen, but need have no entrance examinations, and may select such courses of lectures as they choose. If they intend trying for honors they must take the previous examinations. With two or three exceptions, all the public lectures of the University professors are now open to women.

North Hall is in charge of Mrs. Henry Sidgwick, whose husband is Prælector and late Fellow of Trinity College, and who, with Miss Clough, has given generously of his means to this noble work. Her secretary is Miss Helen Gladstone, the daughter of the premier. That ladies of such social position are willing to labor, for these places mean many duties and cares, is a hopeful sign for the new era when work for both sexes shall be equally honored, and an idle, useless life despised.

Several scholarships are offered, and there is a fund provided, to help those of scanty means. In nine years, 250 students have come

into residence at Cambridge for lectures in connection with Newnham, of whom 184 have passed examinations. Twenty-seven have gained honors, three standing in the first class in moral science, two in history, and one in natural science. No woman has as yet stood in the first class in the classical tripos because no schools have offered to girls the early preparation which boys have at Eton and some other places, where these studies are begun at nine years of age. A classical tripos means translation at sight of all Greek and Latin authors; the putting of English into Greek or Latin verse or prose, or *vice versa*, in a polished manner; an intimate acquaintance with the political, constitutional, social, literary, and religious history of the Greeks and Romans and their art, and a very wide reading.

An honor in moral science means a knowledge of moral and political philosophy, the relation of ethics to psychology, law and politics,—of such books as Mill, Kant, Spencer, and Lotze in Metaphysics; Mill, Whewell, and Ueberweg in Logic; Fawcett and Cairnes in Political Economy; Maudsley's Physiology of Mind; Venn's Logic of Chance; Matthews on Population; Bentham's Principles of Morals and Legislation; Mill's Republican Government, and many more. That several young women have stood in the first class in moral science, after a six days' examination, is proof that they are able to comprehend both logic and politics.

In February, 1881, the University was asked to "formally sanction the admission of women to the examinations which are open to members of the University." A few objected on the ground that loss of health would result from the undue excitement attending the competition for triposes, but as women had for some years obtained honors, granted informally, and one of the leading physicians of the town had stated that he knew of no harm to body or brain having occurred to any student who had distinguished herself, the objection proved futile. A few advocated a line of study for woman "appropriate to her sphere," but others thought wisely that mental fitting for a human being is a thing outside of sex. Said Dr. Kennedy, in an able speech, (the revered canon of Ely Cathedral, one of the New Testament revisers, and translator of many Greek and Latin books): "Deny it who will, I hold they (women) are mentally our equals;" and those who know his family will not wonder how the good man came to his generous and manly conclusion. In all this matter, leading members of the Universary worked earnestly, and deserve the thanks of all American as well as English women. That degrees will come in time, is undoubted, from the kindness already shown by the University.

Those who visit Cambridge in the coming years will probably see not two colleges for women, but many, for the work is but just begun. Thus fitted for usefulness, women will be more capable in homes as well as in professions. Industrial and other pursuits are fast opening to them through such broad-minded men as Professor Henry Fawcett, the scholarly postmaster-general, who has so increased the number of women in the different branches of the Post-Office Department that now 1,276 are employed there. The influence on the coming generation of thousands of highly educated women is incalculable. It will be felt on the important questions which the two great English-speaking nations will be called upon to decide in the next century.

We greatly enjoyed some of the University lectures, especially one by Professor Seeley, author of "Ecce Homo." The lecture-room was full, ladies being on one side and undergraduates on the other. It is said that the young men of the University have been most courteous and cordial in thus giving to women equal opportunities of culture with themselves. Professor Seeley is a somewhat stout, kindly-mannered man, hair turning gray, voice low and musical, and very modest, as a truly great man always is. The lecture was upon the "Separation of the American Colonies from the mother-country," which he regarded as "an event of greater importance than any other in English history." With great ability and rare knowledge the speaker traced the progress of America and her present greatness, and advocated for England a confederation of her colonies, making her a great United States.

After visiting the colleges for women, one could linger in this historic University town for months and never tire of its hospitable and delightful people, nor of its treasures of learning and art. Of course one goes again and again to King's College Chapel, so often called "a poem in stone," 364 feet long and 146 feet high, with its twenty-six magnificent windows of old stained-glass, and its stone roof as delicately wrought as a pattern in lace, though each keystone weighs more than a ton.

Emmanuel College, especially to those of New England birth, possesses singular interest. Built in 1584 by Sir Walter Mildmay, a lover of Puritan principles, it became the home of such men as John Harvard, the founder of Harvard College, Hooker, Higginson, Shepard, and John Cotton. When Queen Elizabeth addressed Sir Walter with, "I hear you have erected a Puritan foundation," his reply was, "No, madam; far be it from me to countenance anything contrary to your established laws; but I have set an acorn, which,

when it becomes an oak, God alone knows what will be the fruit thereof." America is showing the fruit in a great host scattered from the Atlantic to the Pacific, who love right and justice with individual freedom. The Romanizing tendencies of the time caused all chapels to be built east and west, but the good Puritan built the chapel of this college north and south. When Charles II. was restored this was changed into a library, and another built east and west. A beautiful founders' cup, supposed to be the work of Benvenuto Cellini, is used once a year.

The building of Trinity College, the largest either at Cambridge or Oxford, is due to Henry VIII., one of the few good things which he ever attempted. This is in honor of the "Holy and Undivided Trinity," to whom he ascribed a very pious anthem, found in the book used at service. From the lines, one would suppose him to have been a saint. At Sunday evening worship we saw over five hundrd white-robed seraphs, otherwise students in their white surplices, filling the edifice. Accustomed to see these garments only on those set apart for holy offices, the effect was somewhat striking, especially when we observed two men, with long rolls of paper, marking all this saintly company, to see if any were absent. The library, erected from designs by Sir Christopher Wren, is a classic building, divided into thirty compartments, its chief attractions being Thorwaldsen's Byron, with a face as beautiful as it is pure, and the original manuscript of Milton's Lycidas and Comus, in small hand, and much interlined. As the poet was not popular at Christ's College, where many go to see the old mulberry tree he is supposed to have planted, though the matter is greatly doubted, he perhaps is glad that Trinity possesses these treasures. The grounds, one-third of a mile in circumference, with their rows of stately limes under which Bacon, Dryden, Newton, Byron, Tennyson, and Macaulay have walked, the graceful bridges over the Cam, and the lovely views in every direction, make one of the most exquisite landscapes which artist ever painted, or of which poet ever sung.

Close by is beautiful St. Johns, with its new chapel, completed only recently, exquisite in varied marble and windows, corresponding with those six centuries old. Expressing our admiration for a section of gorgeous red, we found that it represented everlasting fire in the last Judgment. More attractive surely than the unique frescoes at Pisa, but of the same genial character! Strangers linger longest and most tenderly at the marble tablet to Henry Kirke White, placed there by an American.

Trinity Hall, — the college of Lord Chesterfield, Lord Lytton, the

novelist and poet, and many others, — has in its library the desks where books were formerly chained, only the dean and master having the keys. In a most unique book, called the "Nuremburg Chronicle of the World," is an æsthetic picture of Eve taken from the side of Adam, that one should not miss seeing. The combination-room, where the Fellows repair after dinner, has a semi-circular table, with a lazy arrangement of early days for passing the wine-bottle backward and forward on rollers, that the drinkers need not rise from their seats. In the buttery one will see not only the beautiful silver-plate of the college, but rolls of butter an inch in thickness and a yard long, — all butter in Cambridge being sold by the yard! The Fellows' garden, surrounded by ivy-covered walls, and dainty with flowers, is like a bit of fairy-land, more fitting for the exquisite communion of "two hearts that beat as one" than for the walks of Fellows, usually unmarried, to whom such thoughts are supposed to possess no attractions in comparison with the measurements of planetary orbits. Here are two grand old trees, whose branches, taking root, have trebled their size, making five like the parent stock,— so wonderful an agent is time, and so fanciful a worker is nature!

The ivy courts of Corpus Christi must not be forgotten, nor Magdalene, with its celebrated diary of Mr. Pepys, in six volumes, closely written in short-hand.

Through the courtesy of Oscar Browning, Esq., lecturer and Fellow of King's College, we witnessed the conferring of degrees in the senate-house, a spacious building capable of accommodatiug one thousand persons. A procession enters, led by two Masters of Arts bearing large silver maces, followed by the Vice-Chancellor in scarlet gown, with long, ermine hood, and by those about to take degrees. Mr. Browning reads in Latin, and then a candidate Master of Arts, dressed in black gown, with long black and white hood, is led up, takes off his black tasseled hat, kneels, and his folded hands are taken between those of the Vice-Chancellor, who repeats a Latin formula. The next candidates are for the degree of Bachelors of Arts, wearing different hoods. One person is greatly applauded, the reason being that he has succeeded in taking his degree at all, as for many terms much of his time has been given to boating.

The daily rowing on the Cam for practice is a pretty sight, the men being dressed in varied costumes,—the "coaches" running along the bank, calling out their orders. Two hours hard exercise is a rule of college-life. The young ladies of the colleges do not row on the river, and thus fail to get the very best exercise, and perhaps the most delightful pastime in the world.

One cannot leave Cambridge without visiting some of its quaint old churches. The most interesting is that of the Holy Sepulchre, one of the four round churches yet remaining in England, consecrated in 1101, and doubtless copied from that in Jerusalem, — the Pantheon at Rome being the original type of all, probably. The interior has eight short, massive piers, surrounded by a second row, with Norman windows. One wonders what was the service of this little company of thirty or forty worshippers nearly eight centuries ago. Strange that senseless stone should be more enduring than the wonderful hand that shapes it!

Politeness does not allow one to tell of a perfect dinner at Trinity Hall, given by the son of one of England's most distinguished ministers; of a lunch at Emmanuel's; teas at King's and Trinity; a charming party at Newnham; nor of the delightful homes visited, where the culture was as choice as the hospitality was generous.

THE EDUCATIONAL DOCTRINES OF JACOTOT.

BY G. F. KENASTON, A. M.

[Concluded from last No.]

We shall now see how Jacotot carried out these principles in the elementary stages of teaching his native language. For a complete exposition and *examples* of his method, I refer to the article of Professor Joseph Payne, by far the fairest representations of Jacotot's views yet written.

His idea was now to have the child expend as little useless labor and waste as little time as possible before getting into the world of books. He is to keep as near as possible to the method nature has made the child follow till now, only his work must be more systematic. Care must be taken that nothing be done to stultify or misdirect a single faculty of human nature, but the development of all which will be needed in the perfect man must be begun. He determined to use no meaningless *a*, *b*, *c*, or *ba*, *bi*, *bo*, *bu*, but to give some nourishment, and have them think as soon as possible.* In short, he used the word-method as it is practised in the best schools to-day, with this addition,—that the pupil was to learn by heart each lesson, and begin with the first lesson each day as long as its extent would allow of it. There is no hurry,—accuracy, attention, repetition, discipline, and thoroughness are the words. After a few lessons the pupil is never to leave a line until he knows "*imperturbablement*" the orthography and meaning of every word, so he will never need to learn them again. He begins to write with the first lessons. The order now is: repeat, add new phrases, repeat, write, verify if pupil has forgotten any word; soon they point out the syllables, then the sounds of the letters. The teacher now applies questions according to the progress of the pupil. The ridicule he received is only balanced by the astonishing success of the experiment. A word is now needed as to the book which Jacotot uses. All is arbitrary in style and language. We learn the words, phrases, expressions, and style which we hear most commonly about us. To save the trouble of relearning and correcting errors in the future, a good vocabulary, style, and method must now be made permanent, a habit, an implement of mind, It is easier to learn a language from

* "The admirable spirit of inquiry which nature has given to the child is soon checked, if we present to him words instead of the ideas which he wants."—*Marcel.*

a well-written history than from a book full of abstractions. It should overflow with facts and descriptions of nature, with words, acts, feelings, sentiments, and deeds of men and women, for these are attractive to children. If now we can find a narrative-book rich in words, expressions, style, and sentiments; showing noble, moral, and heroic examples, observations in life, society, duty, and character; full of tenderness, sympathy, and beauty; such a book will have evident advantages over the usual books given to children. He chose Fénelon's great work, "Telemaque," not as perfect, but nearest to his ideal. Fénelon's book, as his manner, thought, and style, can be proposed for a model to the young. "Simplicity and the excellent nature of the aliment embellishes every description." "Telemaque" is the result of the masterly scholarship of Fenelon, and is a realm of thoughts and facts, presenting thousands of nuclei which will lead to all branches of knowledge.

The study of the native language has now begun. The pupil has already, in learning to read, become familiar with the first sixty lines of "Telemaque." Here is the one thing known; refer everything else to it, Repeat "sans cesse," add a few lines every day, verify if the pupil knows the orthography of all the words, and begins to know their meaning; refer both words and ideas to their use before in the book. Write every lesson. By questions in regard to words, phrases, sentences, and why the author has used them; verify if the pupil pays attention to every point. By this time the pupil has learned one book (thirteen pages), and has so got the spirit of the author that memorizing is very easy. His way, now, becomes more and more critical. Questions multiply. He repeats twice a week the first book; refers every new lesson to it; campares words, phrases, sentiments, facts, and characters; seeks agreements and differences; makes observations, soon generalizations; and tells the story in his own words. Now write your story, then observations upon it; make a composition. In all this the pupil must keep close to his model-book, and justify every thing by reference to it. He must not only make his own reflections and judgments for himself, but be able to tell why he thinks so.

I shall now give, without examples, a series of exercises in which Jacotot sought to develop his pupils' minds, fit them for all other studies, and any field of life: (1) Be sure you have the pupil's attention in every exercise. Excuse a fault of orthography far quicker than "lack of attention," the mother of ignorance. Stimulate your pupil to do for himself. Use all your genius to arouse the attention, memory, judgment, and reflection of your pupil by your questions.

(2) Exercise them in weighing the value of words, sentences, illustrations, and individual parts of the model-book. Verify every assertion by reference to this model. Have them give analyses and abstracts of each part. (3) Make imitations. Take some general sentiment from the book, and write a development of it with different circumstances, terms, and conditions. The pupil reads, and is asked to verify and justify the use of every sentence, the grammar and arrangement, by comparing with the model. (4) Make original reflections and investigations on facts in the book. Here he must use all his powers and knowledge to make his extended generalizations. By questions he is brought to see how many facts, illustrations, and arguments he might have used to sustain his point. He now is urged to make little speeches on any subject. Thus Jacotot leads his pupils to see the necessity of every thing they are learning, and this necessity spurs every faculty. (5) Draw portraits and define elements in the characters of these men of the book. Compare one with another and write their lives as seen in the model-book. (6) Give and explain the uses of the same word in different significations, also different significations of synonymous words. This is done by repeating the lines and circumstances where they are used by the author, comparing and testing the fitness of each word. They are now exercised in writing compositions upon pairs of synonymous words, substantiating every assertion by examples from the model-book. Sentences are read from other authors and the use of words and power of expression compared with Fénelon. They are then interrogated upon the descriptions and use of words in their own compositions. (7) Give examples, and distinguish between synonymous expressions, sentences, subjects, and figures of Rhetoric. (8) Traduction or translation. This assumes a more general and abstract character than imitation, and is the source of inexhaustible exercises. The pupil is to make general reflections from particular circumstances, and generalize from the acts of men their motives, and seek the results of these as applied to different men and circumstances. For example, if he finds that foiled ambition brings regret and grief, compositions are to be made on these as arising from other causes. He is also exercised in finding subjects for traduction; for there must be an analogy in the facts, circumstances, and tendencies. (9) Select and examine analogous thoughts as they appear in different parts of Fénelon. They have given analyses of each book, and now gather up the principal thoughts, reflections, and maxims, and prove his principle, "*All is in all.*" (10) Make synonyms of composition. The pupils have now learned by heart the first six books of Telemaque (75 pages).

They have read the remaining eighteen books, made them the object of numerous exercises, compositions, and analyses (as above). This exercise consists in taking analogous subjects and developing them after a model scheme which they have been led to form from Fénelon's manner of treating similar subjects. He now urges the pupils to cultivate the art of speaking after their model. This is most useful, for he who knows how to speak well can write, but the opposite is not always true. (11) Develop and paraphrase the thoughts, subjects, and reflections of the model-book. (12) Another book, chapter, poem, or any subject is put into their hands, and they are to study, recite, and give a careful analysis and the scheme upon which it was constructed. (13) Pupils are now to study and practice the art of narrating events, writing letters, sketches, tales, etc. (14) Model essays, orations, poems, narrations are given them, and they are to find from each the laws and principles by which it was constructed, and then use these forms to construct compositions of their own. (15) Write upon any literary, critical, or narrative subject. (16) Improvisation of compositions on any given subject in a given time. (17) Improvisation of speeches on a given subject.

Perhaps nothing in a system of education will better show its applicability to the development of the faculties than that a pupil shall be able to bring them to bear on any topic, and so, at once, write or speak to the point in precise and well-arranged sentences. Jacotot did not encourage or believe in the precociousness of children, and yet proofs are plenty that his pupils from ten to fifteen years of age could improvise well-arranged, original, and accurate speeches on any subject within the realm of their knowledge. M. J. Kinker in his report says that pupils of ten, eleven, and twelve years of age improvised on subjects which he gave them with an ability and accuracy most astonishing, and pupils but little older did this in foreign languages better (as he himself says) than himself or his professional colleague could use the language. If a system of education can show results anything like these it demands our attention. The means used by Jacotot seem almost to warrant such results. Improvisation was a means as well as a power. (1) It aroused a deep interest in whatever the pupils heard or read. (2) It is a direct way to bring the pupil's powers into self-activity. (3) It tends to develop the will and power to conquer self, and give a combined direction to the faculties. (4) Life is full of emergencies when thoughts, words, and acts to the crisis are needed, and this faculty, developed with care, is most practical. (5) It adds dignity to our relations with our fellowmen, and gives power to move and lead them.

(18) The study of formal grammar was now introduced. No rules were learned at first, but with the model-book and grammar in their hands they developed the principles, rules, and methods of the language. (19) This exercise consists in comparing all the branches of knowledge the pupil has studied, or is studying, not only in books but in any human works whatever, to prove or disprove his great paradox, "*Tout est dans tout.*" Subjects and books were studied with special reference to find the new in the old, and the old in the new.

In all these exercises the teacher may vary them infinitely, according to his genius and tact, so as to keep the interest and mental activity of the pupil on the alert. But he insists upon the "secret of all mental power"; know one thing or book in all its relations, refer all others to it, repeat "*sans cesse*," and verify all by a comparison with the facts and objects from which they are generalized. It may be said by some that it is impossible for children to do all these things, but Jacotot has proved that it is not only possible for children under fourteen to do them, but to do every one of them in a most successful manner, not only with their own but with foreign languages. (1) In the first place they are adapted to the minds of children, and every observing teacher knows that they can be led to perform these exercises. They require memory, discrimination, observation, attention, and a continual exercise in adaptation, comparison, investigation, and reflection, while reasoning, judgment, and invention are brought into play in a proper degree. (2) The pupil is conscious of his success as the result of his own efforts, and thus is delighted and encouraged. (3) The knowledge and inclination of the child when he comes to school prepare him for these exercises. (4) Every step prepares him to enter upon the next. (5) He is not allowed to forget words and facts once learned, and so loses no time or labor in re-learning the same thing a dozen times. In fact his labor is far less up to fifteen years of age than by the usual methods. (6) Spelling and defining words here find their proper and natural place. (7) The instruction in grammar is here a reasonable exercise, whereas it is not as taught in most of the schools of to-day. They have learned their language from the masters of the grammarians, and can now appreciate and understand the science of language. (8) The pupil is now prepared for study, and the exact study, of foreign languages and the sciences in a scientific manner.

The limits of this paper do not permit me to show how he applied his principles to the various sciences. His native language was necessarily the fundamental branch of study during the first two or three years of the child's school-life, and, taught in Jacotot's manner,

it, of necessity, tended to simplify other branches. The language of mathematics was begun the first year of school, and hastened by going very slow and never passing a thing until it was comprehended. Discipline and power, here, come from conquering thoroughly one subject and not going over many. They are to develop their principles and rules as much as possible from the concrete examples. Every step must give positive and ineffaceable knowledge. Learn, repeat, refer to the fundamental principles, apply and verify; this is the method. As soon as the pupils get into the spirit of their language, a geography, and then a history, is placed in their hands. This they studied in the same manner; of course referring to the model-book, and writing compositions, for it was not education* or instruction to Jacotot unless every seed dropped in the mind could produce something; it must not be the mere furniture, but the active agents and implements of the mind. As soon as pupils became skillful in the use of their language, and were grounded in the elements of the common branches, the higher studies received their attention. By his system they were enabled to accomplish vastly more in the years allotted to school-life than by our methods. The great array of studies which James Freeman Clarke says pupils ought to accomplish in a course of fourteen years of instruction seems possible by this method and by none other yet tested.

I now endeavor to deduce from the principles and method of Jacotot the fundamental advantages of his philosophy of education, as it applies to the first stages of school-life. The school is not an end, but a means. A means (1) to aid the pupil in developing his faculties; (2) to give a desire, right direction, and method for the use and instruction of the whole man; (3) to assist in fitting him to begin life; (4) to give him a tendency to make as much of himself as is in his power; (5) to teach him to be thorough, careful, industrious, and rely on himself; (6) to teach him how to learn and to work intelligently in any field of action or inquiry, and to give him a taste for fruits of the world's thinkers. In order to do this the school must teach the fundamental principles of knowledge, and give materials for future reference and use; the more and the more active kind of knowledge the better.

(1) The principles of Jacotot's system rest upon the basis for a Science of Education. (*a*) It is adapted to the mental constitution of the child, and to bring into play every function of the mind.

* Education, from *Educare*, a frequentative verb from *educere*, and means to draw forth the faculties, or train them. Instruction, from *instruere*, and means to place *in order*, and for a *definite object*.

While it aims to discipline the presentative, it does not forget the demands of the conservative faculty. All methods aim to train the reproductive faculty. Jacotot considers the representative of no less importance; and its whole tendency is to give the elaborative and regulative faculties their proper place and development. (*b*) The method is adapted to the fundamental principles of knowledge, and the very mode of its acquisition is a model of discipline, and not a loading of the mind with undigested material. "Who grasps much holds none firmly," and gets but little real training. Seed planted on the surface of the mind begets neither reflections nor new thought.

(2) The method follows nature, "the archetype of all method," and the principles recognized by the thinkers of the world as the correct method of the learner. Nature makes her pupils observe, investigate, repeat, reflect, experiment, compare and verify; she never explains. Every successful student will bear witness that it is the key to his ability. Success in attainment and discipline, at any age, depends upon knowing one thing thoroughly, and referring everything you read, or hear, or see to it by reflection.

(3) It promotes the self-activity of the pupil. It begins with the spontaneous activity of the child's mind, and gives the nutriment adapted to the child which rouses and sustains the self-activity of the pupil. It recognizes that the main problem here is to train every faculty to its proper function. The teacher's duty is to guide, stimulate, and cheer by his own interest and enthusiasm. The pupil is neither developed nor instructed by what is told him, for it passes away as easy as it comes. He is most assisted when not assisted at all,—only directed. A bird never learns to fly but by incessant practice. Practical capacity in the world will depend not on the amount of knowledge he has in his head, but on the power with which he can apply every faculty of his being.

(4) It tends to train and give right directions to the will. This is the prime factor to be considered in education, for to it is due largely the intellectual and moral difference between men. Attention and application depend wholly on the *will*. Without these neither acquisition, retention, nor development can succeed. The will is guided by that which gives pleasure or its opposite, and it ceases to command when these are taken away. Work beyond this interest is forced by the teacher, and can bring but small results. Here lies the supreme importance of the teacher, in whom enthusiasm is worth more than all the learning of Greece. But a tale, or narrative, of men in action never fails to arouse and stimulate the emotions and attention of children. This narrative may be a work of art, filled with instructive

moral lessons and examples, and these, while they interest, will instruct. In this book the pupil learns to rely on himself, to take delight in the right use of his faculties, and his will takes the right direction. The impress of these first years is for life.

(5) Jacotot saw that curiosity, imitation, motives, interest, and emotion are important factors in the education of children. The abstract and symbolical subjects, arithmetic, grammar, do not arouse and are not, at first, adapted to the capacities and susceptibilities of the dawning senses and intellect. A child should not learn rules and formulæ which he is not prepared immediately to understand. Time and energy on these do not give the longed-for pleasure and interest, and so do not awaken the self-activity, but do injure the working perception and memory, and give distaste for mental labor. The child that is dull at school, and hates grammar and arithmetic because he is not ready for them, will read and recite a narrative with animation. His mind is just as impressible as that of older people to objects of beauty, earnestness, and sympathy.

(6) It rightly combines the analytic and synthetic methods of the mind. It is not enough that a pupil learn and recite the individual facts of a book ; he must organize them into a whole again, see their bearing and force on one another and on the whole. The natural and necessary supplement to the analysis of a subject is its production in an organized whole. The inductive and deductive processes are trained from the very first. Investigation and classification, no less then acquisition, involve numerous conditions and processes which have worth in every step of life, and are now exercised in all their forms until they become habits of mind.

(7) "To extend the knowledge of language is to extend the knowledge of objects." This gives a knowledge and correct use of the native language.* This is the crying need of the schools of to-day. Not only children, but the older, have a deplorable ignorance of the force of words, figures, and style. This causes a distaste for reading and study, for they do not get any meaning from the page, or they mistake the thought and force of what they read or hear. Our language is largely metaphorical, — full of metaphors and synonyms, whose beauty, force and suggestion are lost unless particular attention and study are given them. Without understanding these, what can we expect youth to read? The masterpieces are clothed with them, and so are sealed books to most pupils. Jacotot's system, not only in his own, but in his pupil's schools, produced students who

* I hold that the proper study of language is an intellectual discipline of the highest kind.— *Tyndall.*

spoke and wrote their own and foreign languages in as good style as the masters of the language. In every point, here, it not only has every argument in its favor which is adduced by Supt. Peaslee of Cincinnati, and others for the introduction of gems of literature into the schools, but it has vastly more real advantages, such as going from concrete to the abstract, exciting a continued interest and attention and appreciation ; and besides, the study of a whole work has eminent merits for pupils over numerous patches. "If you wish to know what can be done with a full-freighted command of language," said Lord Brougham, "read the works of Benjamin Franklin, a man who bore the second part in founding one of the greatest empires of the world." Franklin read no foreign language, but his method of studying Addison was just what Jacotot would have every school pursue. Daniel Webster says he obtained his power over words by a careful study of synonyms. Does not the continual advice of the wise to give your time and study to the men who write their language in its purity and force apply to children? Is it strange that results are slow and poor in the classics of ancient and modern languages, in mathematics and science when pupils have not learned the force and bearing of words, phrases, and sentences in the authors of their own language?

(8) This method is a correct beginning of the study of literature. It is safe to assert that double the time is wasted in studying foreign languages and literatures that would be if some of our literary models were mastered and interest aroused in them as a preparation for the classics of the world. Most pupils go from school with having learned merely the names of the choicest products and educators of mind. All these will have lived in vain for the pupil, since a large part of the twelve years of school-life must be spent in arithmetic. This is perhaps the most important study of school, but there is an inordinate amount of time spent and wasted upon it in the common schools. Bain says, "It does not teach us how to observe, how to generalize, how to classify." It does not refine the feelings of children, touch the emotions, rouse the enthusiasm, awaken the love of beautiful thoughts, or enkindle devotion. Jacotot's method of beginning the study of literature is the very royal road to accuracy of words, expression, and thought; it trains, excites inquiry, instructs, and disciplines no less than mathematics. Men are made, not from grammar, arithmetic, or patches of this or that, but by principles which grow into the consciousness from the examples and facts with which they are imbued by their contact with men and books. But, hurrying from from one subject to another, getting the inner spirit of no selection nor author, but continually on the surface among the words, does

not nourish and develop. We cannot truly live with such excellencies of literature as Fénelon's work, without growing into its virtues. But most of our pupils go from school into the walks of life without ever having been upon the mountains, in the atmosphere, light, and spirit of the masters. I believe that Jacotot's success will show the future the immense importance of not only prose, poetry, and oratory, but of fiction, as an element in the school. These have a telling part in awakening and elevating the feelings and intellect of the pupil, in giving new impulses, sympathies, and interests; in refining their taste and natures, and in leading them within the influence of "that most subtile master under heaven, the love of truth, beauty, and nobleness."

(9) This method makes the child a producer from the first. The effort in composition requires the pupil to be alive to every object, fact, and process in it. This causes them to see the need of what they are learning, and teaches how to apply it. There is no way completely to comprehend a description or argument unless you practice the art of making it. The force and exact meaning of words and sentences are never known until you use them. Sir William Hamilton says that a man never knows anything until he has taught it by tongue or pen. Experience shows us that knowledge is not our knowledge until we put it into expression.

(10) It trains the power of vocal expression. Read as you should speak, says Jacotot. It makes good readers and speakers because the first work is to get vivid impressions of the idea. Reading is not the mere calling of words, as is necessarily the case when the pupil goes hastily over what he does not understand. Too much stress cannot be put upon this point of the system. Pure and excellent speech, a clear, expressive voice, more than the best music, reflect their stamp, in culture, on our character. They have, also, the most potent influence in social, business, and public life. "The main thing to be considered," said Locke, "in every action of a child is what influence it will have upon the mind, what habit it tends to, and is likely to settle and strengthen in them." Bishop Berkley says that "one-half the learning and talent of England is lost because elocution is not taught in the schools." I would not urge the vocal training which this system gives first, for its practical use, nor to prevent the poor speech of society, nor to first teach those who are to be lawyers, ministers, or orators to speak with effect, but because by this means a taste for poetry and eloquence may be evoked. This taste lies dormant, and because not cultivated, its educative power is lost.

(11) It inculcates from the first a method of classifying and organ-

izing our knowledge. Every lesson is so mastered in its relations that it finds its connection with the old and thus is not left in a vague, shadowy, ill-defined, and useless state. In our present system of education we acquire many facts, but they lie so unconnected and incoherent, or are so loose and vague that they are useless and soon lost. Students do too much patch work, and so educate (*educare*) too little. Not one-tenth of the labor done by most students pays in discipline or knowledge, just because from the beginning they are allowed to proceed on a "cram" process from the outside, and not on a drawing-out process from within. Hear Coleridge: "Alas!" says he, "how many examples are now present to my memory of young men, the most anxiously and expensively be-school-mastered, be-tutored, be-lectured, anything but educated; who have received arms and ammunition instead of skill, strength, and courage; varnished rather than polished, perilously over-civilized, and most pitiably uncultivated! And all from inattention to the method dictated by nature herself, to the simple truth, that as the forms in all organized existence, so must all true and living knowledge proceed from within; that it may be trained, supported, fed, excited, but can never be infused, or impressed." By Jacotot's method perfect unity reigns in all the infinite variety. All knowledge is brought by discrimination to its own class, and the chain of association makes it useful. Unless experience and knowledge are thus brought into an organized state, they do not sustain and invigorate each other, and memory tries in vain to retain them.

(12) This method keeps in equilibrium the educative and instructive processes of the child. Its great object is to prepare the pupil to interpret men, nature, books, language, in fact everything it meets in the world.

(13) It has nature's method of teaching morals. It leads to see, live with, and love the good. Example educates the child as well as man, more than precept. Reading of noble men in action always educates the child more than its abstract qualities or unorganized bodies. The model-book will bring the child closer to nature in her best aspects, because the writers of such books constantly reverence and reflect her beauties and teachings, and we cannot truly live with nature, art, and religion in good books without being built up into their virtues. "One noble impulse will do more toward ennobling men than a volume of ethical precepts."

(14) This method does truly lead from the concrete to the abstract, from the particular to the general, from the empirical to the rational, from the known to the unknown, as much as is nature's custom.

(15) While the method is especially adapted to the necessities of the vast majority of pupils who will leave school in the secondary and high-school grades, it is not less eminently fitted to prepare them for higher instruction.

Such I deem some of the advantages of Jacotot's doctrines of education. While many of these are attained in the excellent school-work of to-day, yet I can but think the system has practical lessons for our teachers. The results, when dispossessed of exaggeration, are what we should expect of it carried out in the spirit of its conception. Doubtless the enthusiasm of its founder was the soul of it when he was alive, and that afterward practices unworthy of it crept in. If Jacotot taught a class of two hundred pupils the French language in six weeks, no one will say but that the man was a greater element than the method. But this only shows the worth of enthusiasm to foster the growth of mind. The objection will be made that common teachers will be unable to carry out the best part of the system, and so it will degenerate into mere memorizing. I am not sure but this would give better results than the poor teaching of to-day does give. It is most probable that when the true scientific method of teaching shall be found, it will be proved impossible for teachers with little knowledge, spirit, and enthusiasm, or without special instruction in the art and science of teaching, to apply it with any degree of success. Jacotot's pupils applied his system with as astonishing results as himself. Joseph Payne tried it with Homer, with excellent results. It is now used in parts of Germany, France, and Belgium with pre-eminent success.

BOOKS CONSULTED.

Langue Maternelle et Mathematiques. *Jacotot.*
Science and Art of Teaching. *Joseph Payne.*
The Study of Languages. *C. Marcel.*
Lectures on Science and Art of Teaching. *W. H. Payne.*
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THE PLAY-GROUND OF SCIENCE.

BY REV. PAXTON HOOD.

It is more than possible, it is exceedingly probable, that some scientists may express many and very grave objections to the idea implied in the superscription of our paper; the dealing with the amazing facts and discoveries of science in what Schiller happily calls "the play spirit"; but we may suppose the number to be rapidly decreasing of those who imagine that knowledge should *not* be made interesting. The pursuit of knowledge under difficulties has been, by many scientists, supposed to be even essential to its attainment, and the worth of its lessons was synonymous with the pain endured in the pathway to the steeps where the temple of learning shone afar. If any arguments of a substantial nature could ever be urged for these notions, we suppose they would fall now, and upon very listless ears. We believe it has come to be recognized that the more interesting knowledge can be made, the better; we have even seen some of the earliest mathematics turned into sport. Can it be that the world is more interesting itself than in our father's day, that thus so many methods are employed to call forth enchantment and entertainment for young minds from so many objects? But still, for the most part, Science and its subtler teachings are regarded as rather remote and forbidding ground.

One of the most pleasant of our modern novelists, George Macdonald, has described the way in which a tutor struck down his shafts into the mines of knowledge, and succeeded in kindling a glowing interest in the mind of a pupil who was very indisposed to be interested. He very truly says that "things themselves should lead to the science of them." If things be not interesting in themselves, how can any amount of knowledge about them be so?—and then he writes a chapter called "Geography Point," in which, indeed, he fetches "a tooth-picker from the farthest inch of Asia," to teach the rudiments of geography. Without any globes or maps, we should premise that the little pupil had a sad prejudice against all learning in general, and against geography in particular.

Next morning, Hugh (the tutor) and Harry went out for a walk to the top of a hill in the neighborhood. When they reached it, Hugh took a small compass from his pocket and set it on the ground, contemplating it and the horizon alternately.

"What are you doing, Mr. Sutherland?"

"I am trying to find the exact line that would go through my house," said he.

"Is that funny little thing able to tell you?"

"Yes; this, along with other things. Isn't it curious, Harry, to have in my pocket a little thing with a kind of spirit in it that understands the spirit that is in the big world, and always points to its North Pole?"

"Explain it to me."

"It is nearly as much a mystery to me as to you."

"Where is the North Pole?"

"Look; the little thing points to it."

"But I will turn it away. Oh, it won't go! It goes back and back, do what I will."

"Yes; it will if you turn it away all day long. Look; Harry, if you were to go through, in this direction, you would come to a Laplander harnessing his broad-horned reindeer to his sledge. He's at it now, I dare say. If you were to go in this line exactly, you would go through the smoke and fire of a burning mountain in a land of ice. If you were to go this way, straight on, you would find yourself in the middle of a forest, with a lion glaring at your feet, for it is dark night there now, and so hot! And over there, straight on, there is such a lovely sunset! the top of a snowy mountain is all pink with light, though the sun is down. Oh! such colors all about, like fairy-land! And there,—there is a desert of sand, and a camel dying, and all his companions just disappearing on the horizon. And there,—there is an awful sea, without a boat to be seen on it, dark and dismal, with huge rocks all about it, and waste borders of sand,—so dreadful!"

"How do you know all this, Mr. Sutherland? You have never walked along these lines, I know, for you couldn't."

"Geography has taught me."

"No! Mr. Sutherland," said Harry, incredulously.

"And," said Hugh, drawing a telescope from his pocket, "this hill is henceforth Geography Point, and all the world lies round about it. Do you know that we are in the very middle of the earth?"

"Are we, indeed?"

"Yes; don't you know any point you like to choose on a ball is the middle of it?"

"Oh, yes; of course."

Now this study was the very play-ground of science; it is not, indeed, every tutor who is a Hugh Sutherland, but many more might be like him if they would make the subjects on which it is their business

to instruct interesting to themselves; then they could not fail to interest others, and to this end we want more scientific manuals suited to the young.

Man, it has been truly remarked by Professor Tyndall, has a power of penetrating far beyond the boundaries of the five senses. The things which are seen in the material world depend for their action upon things unseen; and, in short, we see that besides the phenomena which address the senses, there are laws, principles, and processes which do not address the senses at all, but which must be, and can be, spiritually discerned; hence, we find man gifted with a mind curious to know the causes of things. He is surrounded by objects which excite its questionings, and raise the desire for an explanation. It is related of a young prince from the Pacific islands, that when he first saw himself in a looking-glass he ran around the glass to see who was standing at its back. And thus it is with the general human intellect as regards the phenomena of the external world; it wishes to get behind, and to learn the causes and connections of these phenomena. What is the sun? What is the earth? What should we see if we came to the edge of the earth and looked over? What is the meaning of thunder and lightning, of hail and rain, storm and snow? *

The demand of the age is for science; this is illustrated in the scientific articles which appear from time to time in our most popular periodicals; month after month they appear,—some hard, many readers say heavy. We shall not dispute with Mr. Matthew Arnold, whether his pessimistic view of our age be a correct one, when, in what seems to us a poor kind of grief, he sings its epicedium:

"The epoch ends; the world is still,
The age has talked and work'd its fill,—
The famous orators have done,
The famous poets sung and gone,
The famous men of war have fought,
The famous speculators thought,
The famous players, sculptors, wrought,
The famous painters fill'd their wall,
The famous critics judged it all.
Uphung the spear, unbent the bow,
The puissant crown'd, the weak laid low;
Many spent fames and fallen mights,—
But one or two immortal lights
Rise slowly up into the sky,
To shine there everlastingly,
Like stars over the bounding hill.
The epoch ends, the world is still."

* Tyndall's Fragments of Science for Unscientific People, page 73.

We do not believe the doctrine of this melancholy dirge at all, however we may listen to its harmony; but, however it may be with the great instances to which Mr. Arnold directs his mournful and affectionate memory, assuredly science is alive, and the popular mind demands science, — and science with all its attendant train of *ologies*, and *ographies*, and *atomies* is in the school-room too, and it is vain to say that it is of no use taking up such subjects unless you excel in them; and it has been truly said *Mediocribus esse* is no more conceded to chemists or zoölogists than to poets. It is a very weak argument. Who wishes or expects every boy who dabbles in chemicals, or constructs a toy electrical machine, to become a Lavoisier, or a Wheatstone, — a Farady, or a Tyndall? Drawing and painting will probably be always taught in schools, though no one is foolish enough to think that we shall ever, on that account, have many more Landseers, or Copley Fieldings than we should have if drawing were as little taught in schools as casting in metal is. Yet, though scarcely any one expects his son to turn out a first-rate painter, the father is glad to have him taught the rudiments of the art if only to please himself, and his friends, by filling his portfolio with sketches while on a walking tour.

And so of science: it should also take an honorable rank in our schools; of popular science, we very well know, it is said that the lectures upon its topics are few, and that most of the lecturers have not the ability to make the doctrines lucid and the illustrations attractive; but we cannot attribute this melancholy absence of interest to the fact that the great arrangements, the marvelous combinations and transformations of nature are supposed to have little interest to ordinary hearers. How strange, is it not, that readings of poetry, passages of fiction, humorous scenes and complications, should have such power to entertain while the great mysteries of nature excite little curiosity, and seem unable to stir a sense of wonder in the mind! It may be, indeed, that such knowledge is too wonderful, — so high that the ordinary mind cannot attain to it, while the humors of every-day life are easily understood, and the clink of rhymes readily effects the ear. However it may be, there is no doubt the impression that science is not interesting, and that only to the initiated, and well informed, can it be made thoroughly entertaining. Such works as some to which we may refer quite contradict this impression, and it is desirable that we should possess volumes such as M. Marion's "Wonders of Optics," and M. W. de Fonvielle's "Thunder and Lightning,"—volumes which may be used as an entertaining lecture, and in which the engravings have all the effect of a succession of well-executed dissolving views.

We have already referred to the utter prejudice in many minds against such popular expositions of science. Thoroughly-furnished scientific minds have, we have said, often contributed to the prejudice, regarding it as a mere playing with the magnificent tools, and idling in the illustrious walks of science, — regarding even the reading thoroughly of such books as we have instanced, or may instance, as, in the well-known language of Dr. Johnson, "the getting a mouthful of all subjects, and a belly full of none." But a mouthful in this sense is all that most can digest; we may not hope to make all over our boys' natural philosophers; and in regard to this, as a great statesman, Lord Palmerston, said, even when addressing a concourse of students at Glasgow, "a little knowledge is better than none at all." All have the ordinary pursuit, occupation, and knowledge of life with which they are familiar, which is the bread-winner; beyond this, to most, it must be that poetry, or fiction, or science, or philosophy is the appendix, the dessert, the occasional wine of life; but the occasional entrance upon the border-lands, the outskirts of some great continent, or department of science, can only have the effect, if the mind be at all prepared, of enlarging the boundaries of thought and observation, and elevating it to the immense regions of knowledge beyond the ordinary highways of life. And, indeed, in our day magnificent achievements, stupendous performances, have become so much the order of circumstances that the ordinary mind needs to step aside into some quiet exposition of science to keep even the sense of wonder healthfully awake. The wonderful has almost ceased to be impossible to us, — what with Menai, Saltash, and Montreal bridges, Atlantic cables, photography, electric lights, telegraphs, telephones, and stereoscopes, and ten thousand other marvelous things which we handle daily without being impressed by their marvelousness. Some lesser, some more exceptional, flash arrests the attention and excites the wonder, leads to more recondite observations; and scientific anecdotes and well-put analogies are of a nature more gently but, perhaps, more really, to open, to stimulate, and to agitate the mind.

Let us begin, then, by making the facts and inductions of science interesting in the class, and in the school-room; and let the teacher feel that he has taught nothing until he has given to his pupils *ideas*. And what are ideas? Definite conceptions of things; for science, especially, cannot be merely taught *by rote*; — that which has been made interesting to the mind is engraven, not merely on the memory, as an inscription on a mysterious tomb-stone, it has been assimilated into the living consciousness.

The merely technical has often been, perhaps always is, a barrier to the apprehension of real knowledge; learning things by rote, so that a stupid child may let every faculty sleep, while pretending to learn the answers to a set of questions, and if the order of the questions be only inverted, we come to something as ludicrous as the scene described between Frederick William the Great and the tall French grenadier who only knew three sentences of German. He had been snapped up on account of his great height, and was instructed to reply to the king's three general questions on parade, — "How old are you?" "Three and twenty." "How long have you been in my service?" "Three years." "Are you satisfied with your rations and lodging?" "Both, your Majesty." The king, however, took the very unusual course, in this instance, of inverting the order of his questions; and so, having heard that the three-years-old infant, of six feet high, had been twenty-three years in his service, he followed up his research by the inquiry, "Are you a donkey or am I?" and was answered, "Both, your Majesty." Such delicious inversions of all sense would be frequently found in the replies to questions where the teaching has been merely technical, without an effort to *educe*, or to draw out living knowledge, and so to substitute an active intelligence for a merely mechanical and, perhaps, a misguided memory.

It has been said by one of the most distinguished masters of fiction, Lord Bulwer Lytton, that, in adopting to his purpose the result of his personal observation on men and manners, he found himself compelled to modify the real in order that he might bring it within the limits of the probable. How truly this remark is illustrated, whether we dwell amidst the unexplored borders of nature, which only operate about us as phantoms starting from and retreating into some marvel-chamber, or whether we proceed to apply the hints given, and so compel the secret from its hiding-place to turn its marvels into utilities. Science teaches that Nature is the instrument and vehicle of Divine ideas; that is, the imaginative aspect of, or, as some would express it, the poetic relations of scientific things. Perhaps most of our readers know, and have read Dr. Faraday's lectures to children, on the "Chemistry of a Candle;" it is a small book, — it is very simple, — there is not a word in it children may not understand; but, in his hand, a simple candle becomes a marvelous Aladdin-lamp, and the book shines like an electric light. The illustrious author, in his very first remarks, says he has selected a candle because, in his illustration of it, there is not a law under which any part of this universe is governed which does not come into play and

is touched upon by the phenomena of a candle; and there is no more open door by which to enter into the study of natural philosophy than by considering so simple a thing as a candle. To the common mind everything is common; but, when the true Aladdin kindles even a candle, wonderful visions start forth from its luminous flames. It is even wonderful that the extraordinary interest of almost everything that is, is not more recognized; it is wonderful that so many people are fond of what is called poetry, — that is, word-music and idea-painting; — that almost everybody is fond of fiction, and its frequently really charming processions of characters and scenery; and that the wonderful kingdoms, and the amazing transmutations of science seem to be in so slight a degree interesting to us. Well may we wonder that we are not more frequently charmed, our attention more absolutely compelled by many of the mysteries of nature and her altogether startling phenomena. A very similar book to that of Faraday's, on the candle, is that of M. Jean Mace on "A Bit of Bread."* M. Mace addresses his little correspondent, in the commencement, by saying, "I am undertaking, my dear little girl, to explain to you many things which people generally think very hard to be understood, and which grand young ladies do not always get taught to them. If we manage, by putting our two heads together, to get these matters into your head, I shall be very proud, for my part, and you will see how very amusing, for little girls, is that science of our learned men which the said learned men sometimes pretend is so dry and uninteresting, — the history of a mouthful of bread." Now this kind of teaching is not only interesting, it is valuable, and this kind of teaching it is desirable should be in the possession of those who have children beneath their care and control. No one who has been much with children can fail to have been struck by the pertinent questions they constantly ask about what they see in the world of nature. As they grow up the questions get fewer; for, in general, the little inquirers are either repressed by parents, who do not care to show their own ignorance, or else chilled and baffled by their manifest inadequacy, — manifest even to their apprehension, — of the reason which is hesitatingly assigned. What opportunities do such questions offer to mothers! Mothers are, of necessity, the earliest teachers; but, frequently, the mother is quite unequal to the heaven-assigned office conferred upon her. We remember to have heard, the other day, a little fellow, of very average quickness, puzzle his mother, and almost woefully, by the ques-

*L'Historie d' une Bouchée de Pain. Lettres à une Pétite Fille sur la Vie de l'Homme, des Animaux.

tion, "Why does the rain come down in drops, mamma? How is it that it doesn't all pour down with a slop and a splash, as when we pour water out of a bucket?" I quite believe that most of the adults who heard him would, if hard pressed, have fallen back on the gigantic shower-bath principle I have heard suggested; that the solid firmament was provided with a sort of double bottom, one pierced with holes through which the rain came when Providence, pulling the string, withdrew the covering-plates. And it is very singular that we have known many mothers who could give to their children a fair notion of the difference between Arians and Socinians, — who would come out quite strongly on the distinctions in ecclesiastical or theological terminology or nomenclature, — who could instruct their little ones in the wars of Joshua, or of David and the Philistines, or who would even give their children some account of the passing controversies of the day, and make young Biblical critics of them, but could give to them no account of the wild-flower which they bring from the hill-side, and has never remarked the distinctions between forest trees; — and how, just as each has a differently matured wood adapted to different uses, so has each a different type of growth and a different shade of green, not merely in spring-time, but all the year through.

Thus, then, we wish there were more scientific marvels for the young, or for those who might desire to convey these charming marvels to the mind of the young, — books which should excite wonder, not so much by analytic, as by a synthetic view of natural things; in a word, books which should be a kind of play-ground, and make science interesting. Teachers, and people in general, are often unfair to science because they do not see its end. Our noble poetess has very finely said:

> "How is this,
> That men of science, osteologists,
> And surgeons, beat some poets, in respect
> For nature — count naught common or unclean,
> Spend raptures upon perfect specimens
> Of indurated veins, distorted joints,
> Or beautiful new cares of curved spine;
> While we, — we are shocked at nature's falling off, —
> We dare to shrink back from her warts and blains —
> We will not, when she sneezes, look at her,
> Not even say,* 'God bless her!' that's our wrong."

"The Arabian Nights Entertainments" hold their place among the books which fascinate by conducting young minds to the unreal

* Elizabeth Browning: "Aurora Leigh."

realms of wonder-land. What if science were to write her thousand and one nights of entertainment which might be instruction and wisdom too!

We meet with a pleasing illustration of this allegoric power in delineating natural things in M. Mace's description of the blood: thus he says, "Every large country-house has a steward, or bailiff; our body has also its steward. But what a steward! how active he is! how he turns his attention to everything! Why, the stewards of great lords are nothing to him! He comes and goes; he is everywhere at once, and that, not by a mere figure of speech, as when you speak of a very active man; in this case the 'everywhere at once' is a reality. Our steward has everything, not in his store-room, but, which is far better, in his pockets, and he empties them, by degrees, as he goes along,—never making a wrong estimate of what he ought to give out, never stopping, but coming back for fresh supplies, without ever growing weary, every minute of the day and of the night. Ah, if you knew how many workmen he has under his control, who work without ever knocking off; who come to him, each one of them, for something quite different from the rest, and who never play over their work,—oh, dear, no! No use saying to them, 'Stop a minute'; they don't know what it is to stop. You must keep on supplying, supplying, supplying to the end of the chapter. This wonderful steward is called 'the Blood.' One fine morning he came upon the rudiments of teeth in your head, asking to be put in a condition to work, and straightway he began with them his distribution of stores. They wanted lime and phospnorus; he took lime and phosphorus out of his pockets. Now, when your teeth began to shoot you know very well you never ate lime and phosphorus, for nothing but milk ever entered your mouth." Now this is surely very interesting, instructive, and suggestive, and in the same allegorical spirit, another interesting work teaches the elements of physiology,—the nervous and powerfully-written "Letters to Brother John."

In this spirit many of even our most eminent and illustrious scientists have aimed to give every one some grounding in science, and it is quite certain that such a method of bringing out the teaching of physics in the home, lesson-room, or the grammar school can only be admirable. Even Sir John Herschel shows the teacher how to make the very highest philosophy entertaining, in his invaluable "Discourses on Natural Philosophy," and his "Familiar Lectures on Scientific Subjects." Thus the great potential speculations, like the modern theories of heat, and its relation to the generation of every kind of force, are like an entrance upon an infinite forest of thought

amidst creative essences and forms. This great teacher very truly remarks, "That only is little which cannot rise to great conceptions"; and one of the highest marks of an extended civilization is the creation of wants and desires higher than material gratification, and the desire of extending knowledge *for the sake of knowing;* the craving after a larger grasp, a clearer insight, a more complete conception in all its relations of the wondrous universe of which we form a part;—and Sir John in his simple, lucid, and beautiful lecture on "Celestial Weighings and Measurings," furnishes at once one of the most singular instances, both of the desire and of its gratification; the solution of that wondrous enigma, the distance of the stars, the problem upon which astronomers with their glasses have exercised themselves with such almost miraculous, and certainly exquisite, delicacy and refinement. The achievements of trigonometry, or the process of triangulation, must seem to ordinary readers almost as wonderful as to the savage seemed the "Talking Chip," as he called it,—the two or three scratches upon a bit of shaving which brought to the missionary, from a distance of miles, the tools and appliances he needed for the carrying on of the building of his boat; and the circumference of the wonders, and marvelous enchantments of science within the last few years has almost infinitely extended. Sensational excitement and scientific discovery can never be regarded exactly as twins, but there is a marvel felt in the mind which even tingles along the nerves and through the blood, and produces upon the spirit even what may be called a sensation of rapture and wonder; and, if less human than some of the miserable plots and counterplots which go to make up man's conception of romance, yet wing the spirit with a sense of the wonderfulness of Nature's ways more wildly and marvelously romantic than anything which even Dante could dream or Doré describe. The old fairy story tells how, when the king's three sons wished to obtain the hand of a certain lovely princess, and were told that he should have it who brought home the most wonderful object, one brought a flying carpet, and another brought the crystal which showed what a friend was doing at a distance merely by looking into it; and the third brought the wonderful apple, by which the most exquisite sufferings were alleviated merely through inhaling its fragrance; but, to the performances of science, these fairy stories are a kind of prophecy,—a "seeing through a glass, darkly." They are mere trifles to what science has done. Borne on the wings of steam, you may travel thousands of miles across a continent in a few days, and nearly a thousand miles in the course of twenty-four hours. With nearly the same ease with which you could

convey a whisper to a friend sitting in the same room, you may send a message six or eight thousand miles away. Science will take you in its arms and wrap you in slumber, in a dream of pleasant sensations, while a surgeon's knife is either taking your leg off or submitting you to some of the ghastly horrors we associate with the knife.

"There are no more Alps," said a sovereign once, when his armies had crossed them; but, almost at the touch of science, we may exclaim, There is no more time, nor space! When Cartin was among the red Indians they had a decided objection to his taking their likenesses; they could not understand how that could be without his taking their souls away from them, although one of them did wax very wroth when his profile was taken, because the artist had, in his instance, taken half a soul and left half a soul behind. But science has a way of catching a soul as it flies through the air. Before you there is nothing, — no shadow, mere and entirely empty space, — a little wizardry, and lo! there you are! the very transcript and soul of yourself. The glasses of science are the true magic mirrors. Upon an inconceivably small disc you drop a point, say of nitrate of silver, not larger than a pin's head, and lo! as you look through the magic glass, you see it growing, growing! a magic tree, the gorgeous glories of whose jewelry far outshine the splendors of those fabled trees of blazing jewels of which we read in the Eastern tale. Every little grain, every drop of water, every thread of hair is alive with wonders, and a mere grain of mud exhibits splendors before which the blaze of diamonds, in the regalias of the old majesties of Europe, become dim and pale. Glancing through a microscope of extraordinary power at a diatom, a friend said to me, after all its glories had gleamed upon our astonished vision, rich as a casket of diamonds, "You see, there's nothing in anything." "No," said I, "far other is the lesson this bit of glass has given to me; it is rather that there is something in everything." And thus, from the infinitely minute play-ground of science, on the microscope, to revert back again to the infinitely large on the telescope, we return again to the "Celestial Weighings and Measurings," which Sir John Herschel has taught us in some slight measure to simplify. The grand discovery of the planet Neptune, by calculations of Lévérrier and Adams, simultaneously proceeding, seems almost to yield, in its splendor, to the discoveries more recently made in the neighborhood of that great,—we must not call it landmark,—say lighthouse of astronomers, the star Sirius; that "superb star," as Herschel well designates it, whose light which it takes twenty of our years to transmit to us, and whose glories it

would take four hundred such suns as ours to kindle, has been for a long time one of the most splendid marks of astronomers' observation. Certain undulations of regular recurrence perceived in it, and which could not be ascribed to parallax, were, by anticipation, ascribed to the attraction of an unseen companion; and in January, 1863, Mr. Allan Clarke, of New York, discovered in its neighborhood a minute star which had eluded all previous observation. Its real existence has long been verified, and there is every reason to regard this as the unseen companion, the presence of whose mild power awakened the mystic palpitations in the fiery planet; and calculations have fixed the distance of the dim and remote stranger at forty-seven times the distance of the sun from the earth. What an illustration does this furnish of those refined celestial measurements to which we have referred!

These celestial weighings and measurings remind us again of what Herschel says in his paper on the Sun, perhaps the most sparkling paper ever written, in simple language, on that immense and distant orb. This great writer and accomplished scientist, says he is compelled to make "statements so erroneous in all their proportions that I dare say, before I have done, some of my hearers will almost think me mad, or intending to palm upon them a string of rhodomontades like some of the mythical stories of the Hindoos," * thus, speaking of the lighting and heating part performed by the sun, he tells us that, if we take all the planets together, great and small, the light and heat thus received is only one 227-millionth parth of the whole quantity thrown out by the sun; all the rest escapes into free space, and is lost among the stars, or does there some other work that we know nothing about. Of the same fraction, thus utilized in our system, the earth takes for its share only one-tenth part, or less than one 2,000-millionth part of the whole. Is it possible to deal with such immense conditions and statements as these so as, in any way, to introduce them into the play-ground of science? To these lost sunbeams, and the immense waste their dissipation seems to imply, it is a principle of physical knowledge not merely to define or describe the known, but to state reasonable expectations regarding the unknown.† There is no question, in our day, more eagerly discussed, nor one which lies closer to the root of all physical knowledge, than that which inquires whether force can be destroyed or not; and we are, probably, to find amidst those lost sunbeams and enormous

* Familiar Lectures on Scientific Subjects, by Sir John F. W. Herschel, Bart., K.H., etc.

† Faraday.

waste, or what appears to us waste, the excessive, exorbitant prodigality of diffusion of the sun's light and heat. To quote the strong language of Herschel, it is probable that we are to find, in this "waste," the means for recuperating the energies of our world, and of our system; but without attempting, on the play-ground, to discover the source and fountain of physical force, or to understand, so as to explain by parable and allegory to the young mind, how it is that the highest law in physical science which our faculties permit us to perceive is the conservation of force, we may yet linger on the play-ground, both pleasingly and profitably, among the sunbeams. Thus, the pleasant novelist, whom we quoted in the earliest part of this essay, in entering upon the mysteries of tree-talk, represents the tutor, Hugh Sutherland, as showing to his young pupil how trees are made;—let us read the passage together:

"Hugh read for an hour, and then made Harry put on his cloak, notwithstanding the rain, which fell in a slow, thoughtful, spring shower. Taking the boy again on his back, he carried him into the woods. There he told him how the drops of wet sank into the ground, and then went running about through it in every direction looking for seeds, which were all thirsty little things that wanted to grow, and could not till a drop came and gave them drink; and he told him how the rain-drops were made in the skies, and then came down, like millions of angels, to do what they were told in the dark earth. The good drops went into all the cellars and dungeons of the earth to let out the imprisoned flowers. And he told him how the seeds, when they had drank the rain-drops, wanted another kind of drink next which was much thinner, and much stronger, but could not do them any good till they had drank the rain first."

"What is that?" said Harry. "I feel as if your were reading out of the Bible, Mr. Sutherland."

"It is the sunlight," answered the tutor. "When a seed has drank of this water, and is not thirsty any more, it wants to breathe next, and then the sun sends a long, small finger of fire down into the grave where the seed is lying, and it touches the seed, and something inside the seed begins to move instantly, and to grow bigger and bigger, till it sends two green blades out of it into the earth, and through the earth into the air; and then it sends roots down into the earth; and the roots keep drinking water, and the leaves keep breathing the air, and the sun keeps them alive and busy; and so a great tree grows up, and God looks at it and says it is good."

"Then they are really living things?" said Harry.

"Certainly."

"Thank you, Mr. Sutherland. I don't think I shall dislike rain so much any more."

Now this, again, is science on the play-ground, and here rain-drops and sunbeams are humanized, and made to play the part of kind and benevolent spirits, and the young pupil is informed, and the imagination is in no particular deceived. And why should not all, or almost all, the hard facts of science be compelled into such a service of beautiful and instructive personification? This is what is meant by pursuing the synthetic, rather than the analytic method, and showing the wonders of nature, not so much by taking things to pieces, as by exhibiting the Cosmos, the whole; thus investing, in earliest instructions in science, the poetry without the experiment, — let that come later when curiosity shall have been fortified by imagination and faith.

Or suppose we were to determine to make clear to the mind of the class the phenomena of sound, and the wonders of the human ear; to attempt to make the little students understand the rhythym which seems to run along, even through mute and material nature, and to manifest itself in the singular relation and adaptation of the organ of hearing. We often speak of the wonders of the human eye, but the marvels of the ear are still more unsuspected,—for the ear is not so much a musical instrument, it is a whole orchestra. Imagine a lute of three thousand strings, — microscopic strings, — exquisite, finely-elastic fibres; it seems even much more natural to speak of it as an orchestra, although so much larger than that we may have seen in Music Hall in Boston, or in the Crystal Palace in England; and every one of those fibres,—each of those three thousand little people, each of those microscopic strings analyses every motion of the external air, and reveals the constituents of which it is composed, even as the violinist tries the chords of his violin. These discoveries were made by the Marchese Corti, but they have been made popular by Professor Tyndall in his very entertaining and delightful lectures on Sound.* If anything could astonish us among the marvelous discoveries of science, or the amazing mysteries of the human frame, then it might well astonish us to learn that, within the ears of men, and without their knowledge or contrivance, this lute has performed for ages, accepting the music of the eternal world, and rendering it fit for the reception by the brain, or the sense of man — how poorly and feebly do the multitudes of arch "*Voituriers*" in a concert represent these singular *otolithes*, — the term which M. Corti

* Sound: a Course of Eight Lectures delivered at the Royal Institution of Great Britain, by John Tyndall, LL.D., F.R.S.

gave to those magic musicians which he discovered, and which, in the science of sound, and the human ear, are appropriately called *Corti's organ.* So this nervous energy and capacity for sound is in everything, and exists everywhere. We often say nature is a mighty organ: God fills it and speaks through it; nature is the instrument of God, and she seems only to have been created, and to exist, for the purposes of the soul. Thus, as Coleridge says:

> "And what if all of animated nature
> Be but organized harps, diversely framed,
> That tremble into thought, as o'er them sweeps,
> Plastic and vast, one intellectual breeze,
> At once the soul of each, and God of all."

This, of course, is the language of poetry; but how shall we illustrate the extent to which it is also real, simply real? Every tree is a fiber, and has a separate tone in its heart; willow, oak, elm, and poplar, — they have each their own peculiar sound. This is not mere sentiment; — perhaps the reader may have heard of Goti-Kow, a Russian peasant, who made a wonderful instrument which fascinated many of the cities, courts, and nations of Europe; he made his instrument from the reeds of trees which grew around his home; — it made him very famous, and raised him to a place of considerable eminence in the service of the Emperor of Austria of that day. Before Goti-kow stood a mere wooden table, and upon it his rude wooden instrument. At first the auditor heard only a sound, as of wood; still, at last, the wonderful instrument, beneath the touch of the genius of the peasant, is described as rising, above all other sounds, clear, warbling like a nightingale,—rich, liquid, strong, like a sky-lark in the heavens, and all who heard it listened with delight and wonder that thus trees could be made to speak. "Such harmony is in immortal souls."

Why would we introduce such stories as these upon the playground of science? To keep the sense of wonder healthfully and reverently alive in the mind, — to produce quite early a something that shall say, "Hush! did you not hear it?" Take that mystery of mysteries, for instance, — electricity, which really seems almost as insolvable a secret as the very soul of man itself. Arago tells how, once, a cobler, or shoemaker, was sitting at his stall and working away with right good will while a storm was going on; the lightning suddenly entered his shop; with courteous graciousness it passed him by, but, in one second of time, it transmuted every iron thing in his shop; it magnetized all his iron tools. We may imagine the dismay of the poor fellow; it was as if the black magician of the old

story, the very sooty one himself, had entered. The hammer, pincers, and awl were alike bewitched, and attracted all the needles, pins, tacks, nails, and sparables; there they were, all firmly adhering to the larger tools. Surely we cannot wonder that the poor fellow thought that one or the other of two things had happened; either that everything in his shop was delivered over to the devil, or else that he was dreaming it all. In England, in Wakefield, a merchant had placed a number of knives, forks, and iron tools, intending to pack them up, and send them away to one of the colonies. In came the lightning; in a second the box was opened, and the articles all spread upon the floor, and when they were picked up it was found that every article was magnetized. Some subtle property had been imparted to each, and each thing might have served the purpose of a mariner's compass; all had been affected by the subtle current. What is this delicate and most subtle power which can exhibit so strange a behavior? Think of it melting a pair of bracelets on a lady's wrist, and leaving the wrist altogether untouched: talk of delicate attentions after that! Jerome Cardan, however, tells of eight reapers, all eating their dinner under an oak-tree. By one flash of lightning they were all struck; yet not one was disturbed; they sat still, — they were all dead, — but there they they sat, all still! When discovered, one was still holding his glass in his hand, another in the act of putting a piece of bread into his mouth, a third was stretching his hand toward a dish. In an instant death had come down upon them; life was suppressed so instantaneously that all the muscles continued rigidly unmoved. The illusion, so much like life, would have been complete only the second of death had completely discolored their bodies, so that they appeared like statues sculptured out in black marble. The wonderful story was for a long time disbelieved, but the catastrophy has been repeated since, and in our own day, in England. Ten reapers were similarly struck in a storm while taking shelter under a hedge. What is this mysterious power which so awfully and yet so gently takes the soul away? When we see animals, or men, cease moving, thinking, living, thus suddenly without any appreciable change in their appearance, or in the mechanism of the organization, it suggests, says M. Foneville, the image of a cage, the doors still closed, no damage done to a single wire, and yet the inhabitant gone, the bird flown. However did the bird get out of the cage? Not the slightest trace of any wound; no scar, no touch, burn, or contusion; no hint of the way in which the mysterious bird escaped from its confinement, and yet gone!

To what a marvelous degree might these stories be extended! for

the workshop of science is all around us, and especially is this true in all the astonishing agencies of electricity. Just as an electrical machine may be constantly rubbing together glass and silk,—just as if we rub a stick of sealing-wax or a glass tube with a warm silk-handkerchief, so the air is always rubbing over the face of the earth with greater or less rapidity. Nature is a great electrical machine. As man guards his roof from the destructive action of lightning dashing to the earth, crashing, rending, burning on its way, by erecting the lightning-rod, whose innocuous point quickly drains the clouds, or, failing to do this, receives the charge and bears it harmlessiy to the earth, so there is a harmless conductor in every pointed leaf, in every twig, in every blade of grass. It is said that a common blade of grass, pointed with nature's exquisite workmanship, is three times as effectual as the finest cambric-needle, and a single twig is far more efficient than the metallic points of the best constructed rod. What, then, must be the agency of a single forest in disarming the forces of the storm of their horrors! While the same Almighty hand has made raindrops and snowflakes to be conductors, bridges for the lightning in the clouds, as it is written in Job, "God looketh to the ends of the earth, and seeth under the whole heavens, to make a way for the lightning and the thunder."

Yes, indeed, the workshop of science is everywhere around us; its materials and tools are everywhere universally present, alike in the objects of art and the yet more abounding objects of nature. It is only because as wonder ceases, novelty expires, that things in themselves awaken no interest. We must find them in the play-ground, that we may make them interesting and charming. Again we say, universally, things in themselves wonderful as fairy-stories lie around us. A pair of spectacles, which the old grandmother takes up and puts upon her venerable nose, and without which she could not see to read,—they are a very common thing, but they surely might be a satisfaction and a suggestion to much youthful inquisitiveness. But it is more important to remark that such science leads, by a succession of easy steps and platforms, to a true *sacro monte;* and did men and women know what visions of things not seen by those who are not pilgrims thither, may be beheld from its slopes, many more pilgrim feet would tread along its not inaccessible, although sometimes steep, acclivities; for it is in science that we possess one of the most assured and certain means of overcoming the skeptic who tells us that he must either handle a thing, or see it, before he can believe in it. In fact it is science which shows us what a little thought had prepared us to expect; a whole universe of invisible things and

powers. It is science which suggests to us how things not seen may yet be known. Man is ordinarily compelled to believe in what he cannot see; he can only see effects, not causes, nor things in themselves. It has been very truly said that the world of sight in which we live is a sort of central point, or table-land, half way between the telescope and the microscope. A very large portion of what we call the material world is invisible, composed of things not seen. Heat and steam are invisible. We can feel a ray, and we can see vapor,— that is an invisible thing rendered visible by condensation from contact with cold air, — but who ever saw the mighty giant at home, in the boiler. This great moving power of the world, this thing which drives a vessel of three thousand tons, against wind and tide, across the Atlantic; or hammers a twenty-ton of iron into shape as easily as you would mould a pellet of bread between your fingers, — that five-hundred or thousand horse-power nobody has ever beheld. The colors of the solar ray are, until made to play upon the prism, invisible; and even then there is reason to believe that color, never detected, is yet lying among the visible and colored rays in that space which appears to be empty; that rays without color, and the forces of the magnet, and of the electric currents are invisible; so that we are conducted to the goodness of "an unseen hand, whence flows all this invisible harmony": this visible harmony, too, the screen of the natural world, lighting up its most beautiful and created marvels in the human soul. Such are some of the assurance which science has given us. Surely such views as these ought not to minister to skepticism. Trees rise in huge and immense forests, but, whether in a slim branch or whether in an Ardennes, or in a Fontainbleau, or in the mighty forests, where the monarch of the woods rises to the height of from two to three hundred feet, — the great timber-builder for every one such magnificent temple, spire, or turret, — is that carbonic acid, the invisible tenant of the air, to whom they all owe their structure, and every coal-bed in existence. Or even, as those long miles of tubes stretching through our cities and towns, filled apparently with noth ing,—nothing apparently perceptible to the eye,—and this *nothing* to burst into harmoniousness!—a wondrous candle,—a light to burn without a wick. Observations, we say, like these become a true *sacro monte*, — a sacred hill. And thus, as along the noble European Rhine, the traveler pleasingly remarks the castellated towers of the remote ages once frowning grimly over the waters, with their vast ramparts and mysterious manchi-colations, but now only objects of enjoyment and recreation, — their dark histories turned into pleasant

stories and fireside tales, and the fields all around them laughing with the vintage of the grape and the corn; so, as the great Time river rolls, on either side rise the battlemented turrets of the great sciences which it seemed once so hard to scale; but they have ceased their frowning, even may be entered, and will furnish to the pilgrim refreshment and recreation, by which, and in which, may be built up the noblest part of the immortal being. Thus, in pursuing such noble sports and divine recreations, we may well, too, bear it as a pleasing consolation that,—

> "A thing of beauty is a joy forever;
> Its loveliness increases; it will never
> Pass into nothingness, but still will keep
> A bower quiet for us, and we sleep
> Full of sweet dreams, and health, and quiet breathing.
> Therefore, on every morrow are we wreathing
> A flowery band to lead us from the earth,
> Spite of despondence, of the inhuman dearth
> Of noble natures, of the gloomy days,
> Of all th' unhealthy and o'erdarkened ways
> Made for our searching,—yea, in spite of all
> Some shape of beauty moves away the pall
> From our dark spirits. Such the sun, and moon,
> Trees, old and young, spreading a shady boon
> For simple sheep; and such the daffodils,
> With the dear woods they live in, and the rills,
> An endless fountain of immortal drink,
> Pouring upon us from the he avens' brink."

MANUAL EDUCATION IN PUBLIC SCHOOLS.

BY L. H. MARVEL.

IN the preceding number of EDUCATION testimony was presented and argument advanced to indicate the strong popular sentiment in favor of some form of manual training in the public schools. The grounds assumed were, (1) that pupils may be prepared to earn a living more quickly and more readily upon leaving the common school; (2) that the dignity and importance of manual labor may be appreciated more highly, since pupils will learn that study and preparation are required for proficiency in the trades; (3) that training of the body may not be neglected while the intellect is developed.

The instruction in technical schools has proved to be valuable in each of the directions just indicated. It is admitted that the manual training of the kindergarten is a potent factor in securing mental discipline. Some similar instruction should be afforded in the common schools. But how to create a system of industrial education so efficient as to commend itself to practical educators, so simple that teachers of average ability can carry out its provisions, and so inexpensive as not to become an excessive burden to tax-payers, is a problem as yet unsolved, and scarcely attempted.

Since manual training has been successfully introduced in classes of pupils below and above the grade of the common schools, the question naturally arises, Why has so little been attempted in the regular grades of public schools attended by pupils from seven to sixteen years of age?

In Massachusetts there is legislative enactment permitting towns and city councils to appropriate money for industrial education, but the local authorities have been slow to avail themselves of its provisions. The first important movement tending to the development of a comprehensive scheme for manual training was the act passed in 1870, by which drawing was required to be taught in all the public schools. But it has taken a long time to develop in the public mind an appreciation of the kind of drawing required. The idea that drawing is simply related to fine-art work is so general, and its relation to industrial labor is so little understood, that it has required much demonstration to make clear its practical bearing in industrial educa-

tion. It is now becoming evident, however, that widespread instruction in drawing must precede any broad development of industrial education; for drawing is the fundamental language by which thought or ideas are conveyed in the industrial arts. As all artisans perform their work in accordance with certain plans, it is evident that a knowledge of how to construct and how to interpret these plans becomes a matter of prime necessity to all artisans. It is as essential that the builder shall know how to interpret the plans, or working-drawings, presented for his inspection as that he shall be able to read the specifications which accompany them, or compute accurately the expense of material to be used. To him drawing is of equal value with reading, writing, and arithmetic; and the same is true of the mason, machinist, cabinet-maker, etc.

The system of instruction in drawing which has been adopted generally in this State, and may be noted particularly in the important cities like Boston, Worcester, Lawrence, and Lowell, has for one of its main objects the development of a knowledge of drawing as applied in constructive industry, or in industrial construction. It has been the mistake of nearly all instruction in drawing, until quite recently, that this feature has been almost, if not entirely, ignored. Hence pictorial drawing, or the drawing of objects, and the practice of designing in the schools, have received undue consideration. The attention now being paid to the subject of constructive-drawing will soon change the whole character of art-instruction in our public schools. Not only will it serve to make the study of drawing eminently a practical study; it will also tend to develop the purely æsthetic features which belong to the subjects of object-drawing and design much more educationally, and much more broadly, than has been found possible hitherto.

Instruction in drawing, therefore, when proper attention is paid to the feature of industrial construction, becomes a fundamental part of general industrial education; but it should be borne in mind that instruction in drawing which is limited to object-drawing and design, has but a partial or incidental bearing upon general industrial education.

A special illustration of the intimate relation of drawing and construction is presented, in plates III. and IV., so clearly that no one can fail to apprehend the character and the educational, as well as the practical, value of the work described.

With the exception of instruction in sewing, provision for which is made in a few schools, no other line of manual training has been established at public expense in the common schools. The principal

reason for this neglect is, that so few persons fully apprehend the scope and purpose of the instruction proposed. There is a very proper objection to making apprentices of the pupils, turning the schools into work-shops, and educating the children for special trades. Not realizing that the end sought is training and not a trade, and not understanding that facility in manipulations common to all artisans may be secured without special apprenticeship at some particular trade, many persons have attempted to criticise the scheme of manual instruction while totally ignorant of the fundamental principles of the plans which its advocates suggest. It is by no means intended to make blacksmiths of these, carpenters of those, stone-cutters, machinists, printers, etc., of others, but to train all alike in a few manual operations common to all the trades, in order that there may be a normal development of the body as well as of the brain. The public schools are by no means designed to teach special trades ; neither are they intended for special professional training. But they should furnish instruction as directly adapted to the wants of prospective artisans as to the needs of those pupils who propose to enter the learned professions. This has not yet been done. But those educators who have given the subject the most careful attention, and have satisfied themselves by experiment and observation of the truth of their statements, claim that there are certain fundamental operations, — *e. g.*, hammering, — essential to all trades, and of value to the several artisans, just as drawing has been shown to be valuable to many classes of workmen. Pupils over twelve years of age are generally large enough and strong enough to perform many of the manipulations which are required, and are sufficiently mature to understand the directions given. Without teaching a trade, the elements of the trades may be mastered, and the graduates of our public schools enabled to go out into the world the better fitted to take up ordinary lines of work on account of their school-training.

Professor C. O. Thompson, who does not favor manual education in elementary schools, emphatically states that, "Speaking now of pure manual dexterity, without any connection with invention or with auxiliary mechanism, I affirm, unhesitatingly, that the highest degree of this skill has been attained by attentive, unremitting, prolonged, concentrated, and enthusiastic practice of a few mechanical motions." This is said respecting the skill of the artisans in India, which excites the envy and admiration of the missionaries sent out to educate them.

Professor Felix Adler claims that, "There are certain mental operations that underlie manual operations. These children should be taught so that their manual operations may become transparent to

the mental operations that underlie them. In modern times capable men have discovered that there is such a thing as a theory of tools; that tools can be classified and grouped, and that a child's mind can be led along in orderly succession in learning them. It has been shown that there are three great types of tools, involving three great principles by which, and the combination of these principles, every kind of tools can be explained. There are reasons underlying manipulation; why an axe should be wielded in a particular way; why an axe splits, and why a knife cuts wood. The double-cutting edge of a plane exhibits a rational contrivance, and has an interesting explanation of its own. The children ought to be taught these reasons, and made to understand their explanation, even while they use the saw and wield the axe, strike with the hammer and move to and fro the plane."

These gentlemen, the former of whom does not approve the adoption of manual training as a portion of the regular *curriculum* of common schools, and the latter of whom is one of its most earnest advocates, substantially agree that the practice of a few fundamental mechanical motions is of vital importance in securing manual dexterity. Practice of using the left hand as well as the right would be of great practical benefit. While every one cannot become perfectly ambidexter, there is no valid reason why, by careful training, both hands may not be rendered nearly equal in strength, skill, and usefulness.

By special gymnastic exercises, or otherwise, these fundamental motions should be practiced regularly and daily in the public schools, (1) because of their value as a means of physical development; (2) because of their wage-earning value in after-life; (3) because no other place affords the facilities of the school-room for regular, systematic, enthusiastic practice.

Although, with the exception of instruction in drawing and in sewing in a few schools, the public schools have not attempted to bridge the chasm from the kindergarten to the high school by any form of manual training, a private enterprise (the Workingmen's School, 1521 Broadway, N. Y.) has instituted a course of instruction thus broadly outlined by Professor Felix Adler, director of the school:

> Now, furthermore: I believe that work-education can be given to the youngest children, in the lowest classes of the school. And here is perhaps the main point, in which the importance of what we consider to be our new departure in education becomes apparent. For industrial education has long ago been given in many countries of the world to older children, boys of fifteen or sixteen years of age; but industrial education has never, to our knowledge, been introduced in the lower classes of schools; has never been combined

organically with the whole scheme of education, and been made to support and coalesce with all the other studies of the child.

Work instruction is not a something outside the regular instruction; it is an organic part of the regular instruction. It becomes a means of teaching mathematics, for instance, more thoroughly, causing the pupils to work out mathematical truths with their very hands; it becomes the means of teaching natural history more effectively; it is worked into inseparable connection with the entire scheme of the scholar's mental and moral development. It becomes the means of making the hand a wise and cunning hand by putting more brain into it. But, on the other hand, it also makes the brain a clear and vigorous and enlightened brain, by giving it the salutary corrective of the demonstrations of the hand. And so the system of work education, considered as an advance in education generally, has a value of its own.

And here it may become apparent why our school is not an industrial school in the sense which commonly attaches to that name. We shun the name, and call ours the Workingman's School, because we wish to keep away from us the ideas that are associated so frequently with the name of industrial schools. We do not propose to give our pupils an aptitude for any particular trade; we do not propose to make them tailors, or shoemakers, or printers. We would consider that a retrogade step rather than a step in advance, if we were to prevent these young lads and little girls from spending even a few years in gaining knowledge, without any reference to the pitiable necessities of their after-lives; we do not propose to yoke their young souls, before they have had time to expand at all, into the harness of trade merely for the sake of getting their bread afterward. We propose to give them that which will secure them bread thereafter, and many of the higher treasures of human existence, we hope, besides; we propose to give them a broad and generous education; we propose to educate our pupils so that they shall become not working drudges, not working slaves in the treadmill of labor; but so, that while they remain *working*men and *working*women, they may also be, in the best and noblest sense, working*men* and working*women*.

Such a school, then, we would build up, whose fundamental purpose may be expressed in the words, *the emancipation of the working classes through their work*. And, if we cannot find competent teachers here, why should we wait till American universities will give us what we want; can we not call, if we are supported in this undertaking, the most competent teachers from abroad, and so transplant the richest results of European experience to our own soil, though always so modifying the matter and the method of instruction as to suit the altered conditions of American life?

Mr. Bamberger, the principal, presents the following detailed statement of the special features of their scheme of manual training:

In the school proper, then, we seek to bridge over the interval lying between the preparatory kindergarten training and the specialized instruction of the technical school, utilizing the school-age itself for the development of industrial ability. This, however, is only one characteristic feature of our institution. The other, and the capital one, is, that we seek to combine industrial instruction organically with the ordinary branches of instruction, thus using it, not only for the material purpose of creating skill, but also ideally as a factor of mind-education. To our knowledge, such an application of work-instruction has nowhere, as yet, been attempted, either abroad or in this country.

In practically attacking our problem, however, we were compelled to meet great difficulties. The choice of material for the children's work presented a first difficulty.

The softest wood is too hard for the delicate fingers of children seven years old, and, moreover, requires the use of heavy and sharp tools, such as are not willingly intrusted to little ones at so tender an age. We finally decided to use clay. Clay, after it has been prepared in a special way for this purpose, is easy to cut and manipulate, does not stick to

the tool, and is not brittle enough to break and crumble. This proved entirely successful.

A complete series of patterns had to be invented which might be worked by young pupils out of this material. Thirty such patterns have been produced, and in them we have the system of elementary industrial exercises, with which we begin. These patterns are described in our illustrations.

Let us now look at our little workmen at their work.

By means of a simple arrangement the school-desks are converted into work-tables. Every child is supplied with a set of cheap and suitable tools. The work-lessons occur in the afternoon on two days of the week, and last two hours each time. The pupils are obliged to behave as quietly during work as in the other school-hours! only just so much whispering is permitted as is necessary for the requesting and rendering of necessary assistance. We endeavor to give the school-room the air of a well-conducted work-shop. Each pupil-workman has his own place and tools, for which he is held responsible so far as possible. All begin work simultaneously, and stop at the same moment.

We now come to the work itself. Plates of clay of irregular outline, ten to fifteen inches in length and breadth, and about one to one-and-a-half inches thick, are given the pupils.

The first lesson consists in the construction of a square from such a plate. The children place their rulers across one side of it, and with their pointed chisels draw a line along the outer edge. This is not so easily done as one might think. The children must practice the following precautions: they must apply the ruler correctly, and hold it firmly with the left hand so that it cannot slip, and produce a crooked instead of a straight line; they must also select the proper tool, and hold it lightly and skillfully, if the straight line is really to be faultless. Finally, from the outset, they must learn to estimate the amount of their material, and to avoid wastefulness. To this end they are shown how to move the ruler toward the edge as far as possible, so that none but useless pieces, or, at least, few others, may fall away. When this is done they take up their chisels and smooth on the cut-side according to rule, — that is to say, they learn to wield their tool after the fashion of the master-workman, in the manner in which it most speedily and accurately does its work. If they have done this the cut will show the required perpendicular direction, an impossibility, if the work has been performed incorrectly or awkwardly. Each worker thereupon applies his ruler to the section, and convinces himself that it really is accurate. The side is then completed.

We come to the second part of the work: the square is applied to the plate of clay; the second adjacent side is ruled and then chiselled off like the first. Then the children learn the use of a new tool,—the carpenter's square; they learn the signification of a right angle, and the eye soon grows so accustomed to this new form that it detects the slightest deviation from it. Not all, indeed only a few, among the pupils are able to do this work correctly at first; but after many trials and repeated corrections the little workman gradually becomes clearly aware of what is required, and how the squares of clay look when they have been marked off perfectly. Now, proceeding from a given point, equal portions are taken away on either side. Here the child learns to know and use the rule, and becomes acquainted with the simplest lineal measure. The two remaining sides are constructed in like manner to the first two, and the square is then so far finished.

We now give the class a number of exercises on the square by means of which all the properties of this fundamental geometrical figure are rendered more and more familiar to the pupils. Thus it becomes clear that the square has four sides of equal length, and that when one side is known, the length of the others is at once known also. It is further obvious that the square possesses four right angles. Finally, by applying the carpenter's square to all the sides of the clay square successively, it is seen that the opposite sides are equally distant from each other at all points: hence, that they are parallel.

Further exercises: the children are told to lay their rulers diagonally across the squares and draw a line upon the clay. They measure this line, and are asked, Is it longer or shorter than any one side? Then another diagonal line is drawn, and also measured. How long is this? we ask. Surprised and in joyous excitement they discover that the

lines are perfectly equal. They are then told that these lines which they have drawn are the diagonals, and shown that *they have themselves proved the diagonal lines in a square to be equal to each other.* This was not taught them; they have found it out for themselves, and will never forget it. The little ones quickly discover that only two diagonals can be drawn in one square, and that these intersect each other at a certain point. They are now directed to measure again, and they find that this point and no other is equally distant from the corners, and that the diagonals cut each other into halves. By application of the carpenter's square they now find that again there are four right angles about this point (centre). The sides of the square are likewise divided into halves, and the central points found. The lines that connect the points must pass through the central point of the square.

The exercises on the square are continued until the larger number of pupils can make one without assistance, and are perfectly familiar with its properties and relations. It is a matter of course that the squares are made in various sizes, according to a specified measure, so that the childred may be thoroughly exercised in lineal measure.

The undersigned, after having taught the lowest class of the school during a whole month, — *i. e.*, during sixteen work-hours, — had the pleasure of seeing that nearly all his pupils were able to handle the clay-square according to his expectations. Although the exercises are continually made more difficult, it is yet plain that they will be mastered in shorter and shorter time, in proportion as the hands and eyes of the children daily grow more practiced, and what has already been taught comes up in review at almost every fresh stage of acquirement.

Lesson No. 2 requires the construction of a rectangle. This figure is first accurately described, and contrasted with the square already studied. The quickness and correctness with which several of the pupils immediately recognized the essential differences between square and rectangle were a great satisfaction to me. They noted that the sides are equal in pairs (parallels); that the diagonals are equal to each other, but do not intersect at right angles, etc., etc.

New facts and difficulties are successfully encountered. Squares and rectangles occur in the most various combinations; these numbers are especially adapted for exercising the hand. When the drawing has been made on the plate, and by means of the indicated aid-lines cut away to about half the plate's thickness, the shaded parts are carved out, and the figure then stands out in relief. See plate I., (1) and (2).

No. 3 introduces a new form, the triangle, which offers no difficulties to the pupil. Preliminary practice may be obtained by letting the pupils divide a square or rectangle diagonally once or twice, by which means either two or four equal triangles will be produced.

No. 4 represents the three forms, square, rectangle, and triangle, in pleasing combination.

A new series of lessons begins with No. 5. The pupil now for the first time makes use of the compass. A regular hexagon is marked off by means of the radius on the circumference of a circle, and then inscribed within it. It is not necessary to dwell on the gain in mathematical knowledge which is here obtained, and all the useful and noteworthy facts that may here be shown. In the illustration itself it is indicated how the central point of the square and rectangle is to be found.

It is understood that the work of the second school year shall begin with No. 5. This is followed by other numbers, representing strictly mathematical forms, (6) and plate II., (7); a mathematical construction, the dividing of a straight line into any number of equal parts, (8); and objects of every-day life, in which all the forms hitherto taught appear in the most various combinations, (9), (10), (11), and (12).

When the children reach the age of nine, and have already worked for two years, it may be assumed that they possess enough strength and skill to work in wood, and to manage a small saw. It may here be remarked that this has been proved by the experience of industrial schools in Germany, especially in Saxe Weimar.

Articles constructed of unbarked wood make a favorable impression when well executed,

and their fabrication does not require an unusual degree of skill nor elaborate tools. As regards the latter, a saw, a knife, hammer and nails suffice; for the smaller articles, a little glue is requisite. The materials may be maple, hawthorn, hazel, or similar woods, which are cheap, handy, easy of transportation, and can be manipulated in the school-room. These woods are procured in rods of various length, and from one-quarter to one-and-a-half inches in diameter. The articles constructed are: photograph frames, match-boxes, saving-boxes, four-footed garden furniture, and a particular three-footed sort.

When the pupil has attained his eleventh year, and enters on his fifth school year, he is intrusted with a scroll-saw to work in wood, and later on, also, in zinc. This kind of work is in itself quite easy, except in its artistic finish, but very important. Here, for the first time, the pupil learns to work after a drawing, which drawing must be thoroughly understood. A new feature consists also in the opportunity now afforded for *designing patterns*, which tends to develop the imagination.

It is true that such work in wood and zinc, when not executed by proficient workmen, always has a rough and unfinished look, the wood being usually poorly cut out, and the various parts inartistically joined together, since it is rare that any one is able, without special instruction, to round off and smooth the cut edges properly. For this reason we propose to connect the rudiments of wood-carving with this sort of work. The necessary implements for wood-carving are a scroll-saw, drill, gouge, and file. The wood and patterns are cheaply procured; of the latter, only the copies *made by the pupils themselves* are used.

The work done in zinc is almost new, and little known as yet. It forms a higher step in this species of work. The awl replaces the drill, and a foundation of wood is used. Remnants of zinc can be bought up cheaply from tin-ware dealers. The simplest house and kitchen utensils are manufactured,—such as pot-covers, spoons, frying-pans, strainers, pots, salt-cellars, etc., etc.

The seventh school year begins with instruction in the large field of carpenter's work. The complete outfit of a work-shop is now requisite, and the carpenters' bench becomes the pupil's true work-table, while various planes, drills, and saws constitute the necessary tools.

The articles manufactured are at first limited to the most simple household utensils, but the pupils speedily advance to more complicated work. When this branch has been thoroughly pursued for a period of two years, carving and turning offer very few difficulties to the worker. The preliminaries here are always carpenter's work, and the free-hand exercises with the clay constitute an additional preparation.

This species of work forms the introductory step in the Russian workshops, and is followed by instruction in turning, and in the locksmith's craft.

Such is a brief outline of the industrial exercises planned for our school, and of which the earlier are already in operation. The plan is by no means in so far definite as not to be open to modifications, which our own experience, or the criticism of others, may suggest; it is the provisional plan upon which we propose to proceed, and the first steps of it at least have already been approved by experience.

These exercises possess *eaucational value* in many different ways, and may be shown, as we have said in the beginning, to be in close connection with many branches of instruction, and with the collective education of the pupils. Instruction in drawing must of necessity go hand in hand with the modelling. What is drawn here is manufactured there, and *vice versa.*

Further, the rudiments of geometry are taught by means of this work far better than with the aid of mere diagrams. And a large number of definitions and propositions, which are commonly remembered by routine, are, by our method, demonstrated to the eye, and thus remain stamped on the mind forever.

Knowledge of arithmetic is also incidentally acquired. The children learn to cipher practically, to add and subtract, to read the figures on the scale, to divide and multiply them in the most various combinations.

Even certain of the facts of natural history may be taught in connection with the work.

The children learn to know the material which they are handling; they study various kinds of wood, their properties, marks of recognition and adaptation. The teacher goes back to the tree out of which the wood has come, and explains the formation of the annual rings so easily perceptible to the children. They are taught from these how to determine *the age, quality, and value of the wood.* Forms of nature, also, are actually copied in wood, clay, and plaster, whenever such imitation is possible; and when it is not, recourse is had to drawing.

In this way we endeavor to make work-instruction contribute toward the general development of the child. *The hand is educated by the mind, the mind by the hand.*

Any unprejudiced visitor to the school must admit that the plan of instruction possesses positive educational value, and educators who scan wisely the signs of the times are watching carefully the result of the experiment, that they may profit by the adoption of its merits and avoid copying its defects. As the first experiment in precisely the field it occupies, this carefully-matured scheme excites general attention.

After pupils are old enough to use wood-working tools, several classes have been formed from pupils of the public schools in different cities. The object has not been to teach carpentry as a trade, but simply to furnish a training in the nature of the implements employed, and in the best methods of employing those implements. Constant attention is demanded, habits of method and system in the performance of work are established, and the continued employment of the hand and eye, in unison, results in quickness of perception and accuracy of manipulation.

An illustration of the work in these schools is furnished by plates III. and IV. Such work can be done by the average pupils in the upper grammar classes [eighth or ninth year at school] after a course of forty lessons, of one-and-a-half to two hours each. This work is a logical sequence of the work in constructive drawing. Pupils in one class, *e. g.*, will construct the object to be made under the direction of the teacher. Pupils of the succeeding class may be required to make working-drawings of the objects made by the pupils; in the next class the pupils will take the drawings, and, without farther instruction, will construct the object required. By this means drawing, as the language of the artisan, is employed in the one class to describe what has been accomplished; in the other, to indicate what is to be done. This is certainly a legitimate development of the subject of industrial drawing.

From the work which can be performed at the close of one year, without detriment to any of the other departments of school work, and at a very moderate expense, — not to exceed $3 per annum for each pupil, — it is evident that the special work has a direct bearing

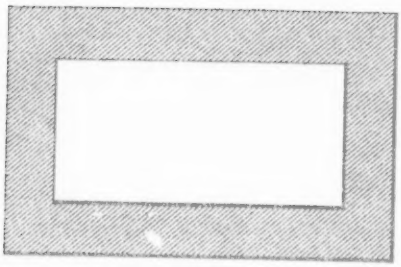
upon general education, and can be carried on without great expense. If regular instruction were given in the use of carpenters' tools in the two upper classes of the grammar schools, and in the lowest class of the high school, followed by work in iron (forging, filing, planing, etc.) during the remainder of the high-school course, boys who would graduate from such a school after thorough instruction in mathematics, science, and modern languages, might, at the end of three years' practical work in the regular shops, upon attaining their majority, become the most efficient of master-workmen. They would be competent to construct, readily and accurately, from well-drawn plans, whatever might be demanded, and often enabled to originate valuable designs; while their knowledge of the laws of mechanics and the properties of matter would be of inestimable service to them if attempting important inventions of any kind. The earnings of such boys, for five years after leaving school at least, would be double those of the graduates of high schools as at present conducted; and this is by no means an unimportant item. The industrial training would furnish excellent mental discipline, as well as physical exercise, for any member of the school. It could not fail to be of great pecuniary advantage, also, to pupils whose future occupation would require the employment of tools similar to those in the use of which they had acquired dexterity while connected with the public schools.

In respect to the right of the State to furnish such instruction, President E. E. White's article upon "Technical Training in American Schools" presents the subject in the following concise statement of fundamental principles:

(1) The State has a right to teach any branch of knowledge that will promote the public welfare. This is the broad position on which public education rests. The attempt to draw a line through education, and deny the right of the State to cross it, is illogical and futile. The State has either the right to teach all branches of knowledge or it has no right to teach any branch. There is no middle ground.

(2) The right of the State to teach all knowledge does not necessarily make such instruction its duty. The right to teach is one thing, and the obligation to teach is another. The duty of the State in education is limited by its ability. It cannot teach all persons all knowledge, and it is not its duty to attempt it. When the teaching of one kind of knowledge necessarily excludes more important instruction, the State is released from obligation to teach such knowledge. If it has not the ability to cover the whole ground, it becomes its duty to give attention to the more important and useful.

(3) The duty of the State to teach is also conditioned by necessity.



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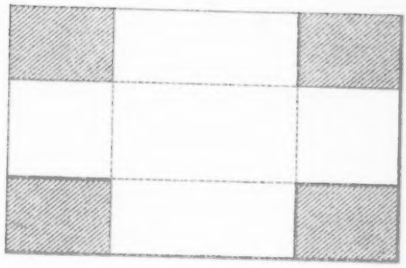

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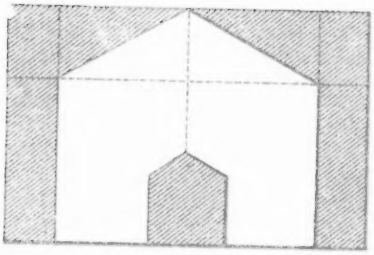

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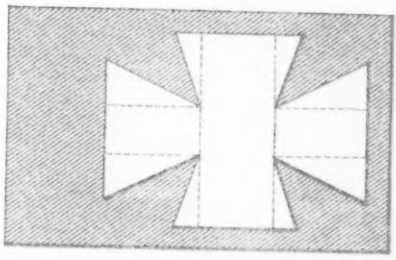

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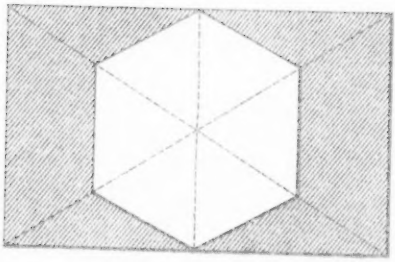

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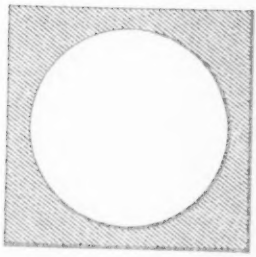

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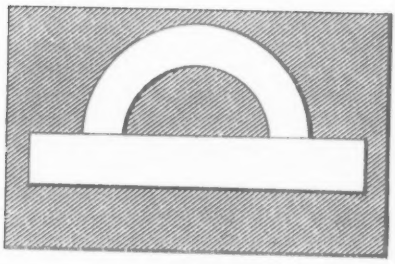

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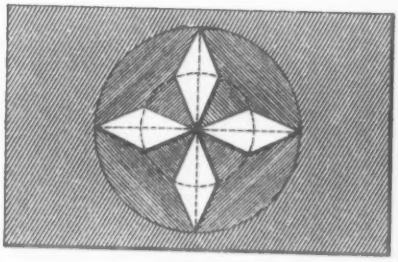

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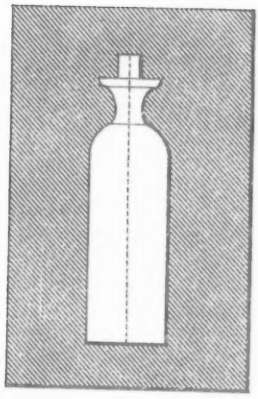

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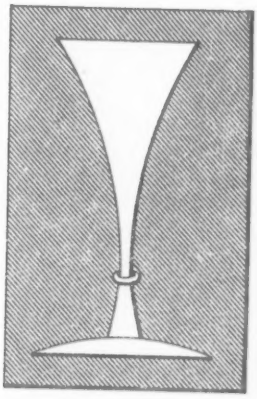

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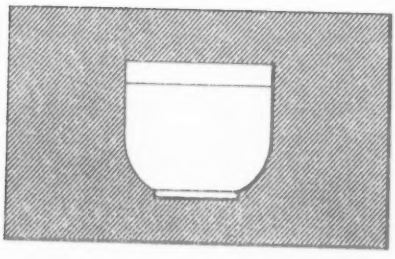

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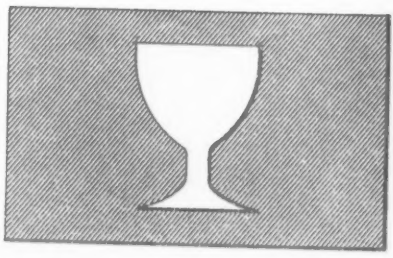

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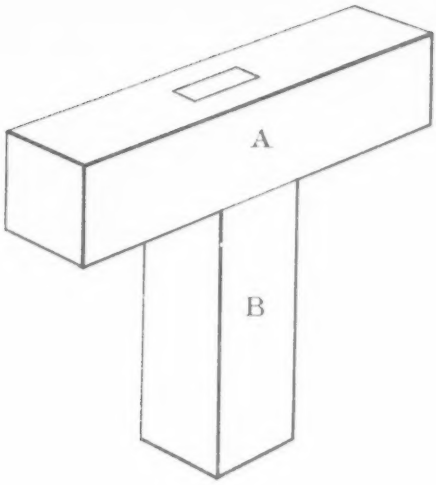

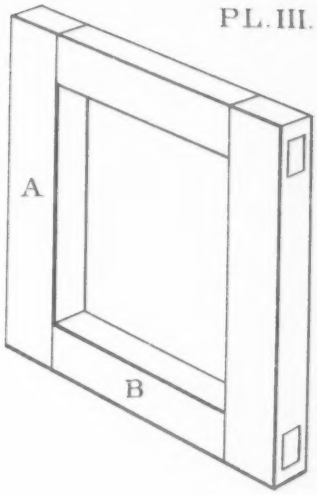

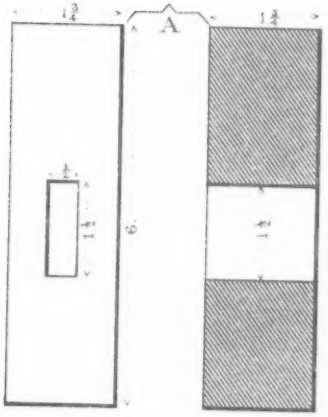

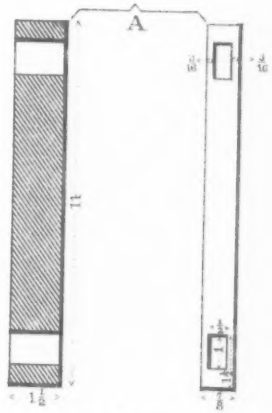

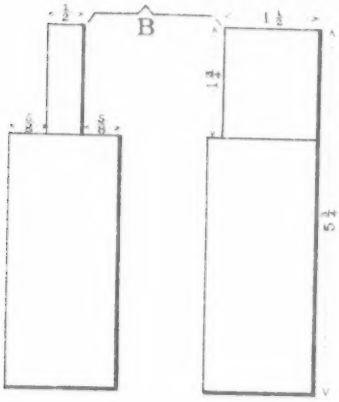

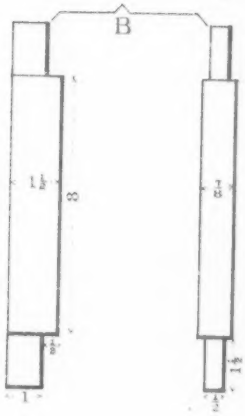

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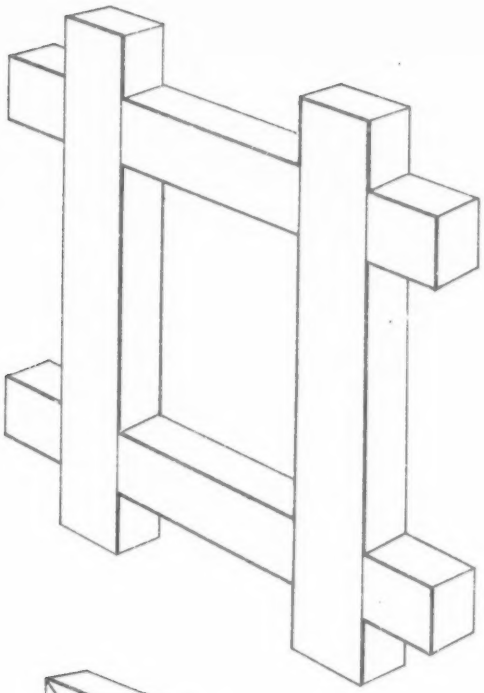

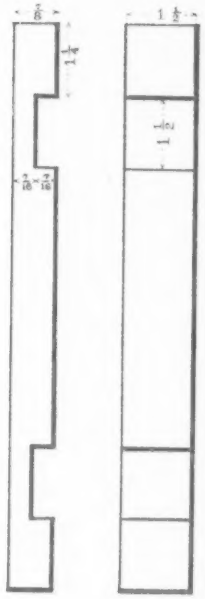

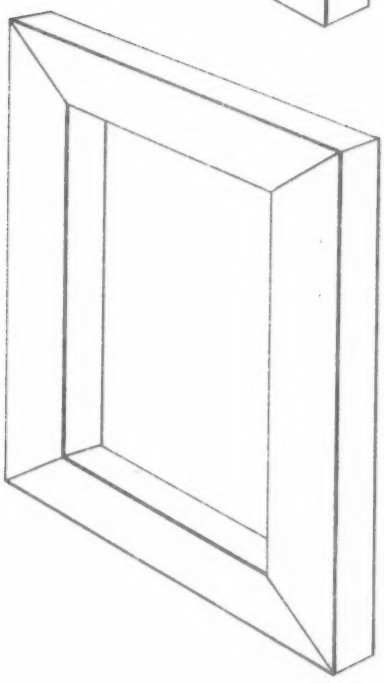

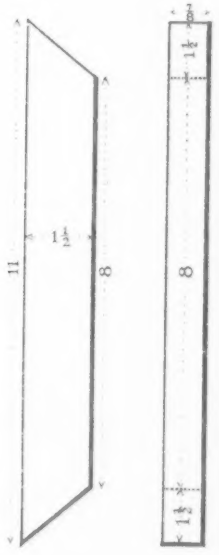

The State has no monopoly of education. The church, the family, and the individual have also the right to teach, and every human interest may organize and support schools for its promotion and benefit. When needed, instruction is or will be given by other agencies. The State may or may not provide it. Its concern is to see that such necessary instruction is efficiently given.

(4) The primary and imperative duty of the public school is to provide training and to teach knowledge of general application and utility. It recognizes no class distinction, social or industrial, but provides a general education for all classes of youth. It is a *common* school, a school designed to impart a common education,—an education open to all and useful to all.

This primary function of the public school is of the highest practical importance and value. Its comprehensive aim is to prepare the child to discharge the duties and meet the obligations of coming manhood, including his relations to the family, society, and the State,—relations involving the highest and most important activities of civilized life. In performing this function the public school assumes that every boy that crosses its threshold to receive instruction is to be a man, and that his first and highest need is to have all the elements of manhood within him developed, quickened, and energized. The first element in this elementary training is character, and the second is intelligence,—moral and intellectual furnishing and force.

(5) The public school, as above defined, exhausts neither the right nor the duty of the State in education. The State may establish higher institutions, and it may organize or encourage special schools to promote important industries or to meet the wants of classes. It has the right to supplement the public school by special schools for technical training.

In conclusion, the following brief summary of the points to be established is presented:

(*a*) There is a constantly increasing popular demand for results of greater commercial value from our educational system.

(*b*) Manual instruction can be afforded, not only without detriment to intellectual advancement, but as a valuable auxiliary to mental progress.

(*c*) There are certain fundamental operations which may be taught as the basis of all trades.

(*d*) The State has a right to afford such instruction.

(*e*) All experiments in the department of manual training are suggestive, and demand the attention of the most progressive educators of the country.

*HOW TO IMPROVE THE QUALIFICATIONS OF TEACHERS.**

BY W. T. HARRIS.

THE superintendent of schools finds it his most important duty to create and foster an enlightened public opinion in regard to the province and functions of the system of education under his charge.

Where the people furnish the material means to support the school, and choose teachers and superintendents to direct it, public opinion marks out the limit of development, For the teachers and superintendent must represent the will of the people. They cannot successfully establish measures not approved by the community.

On the other hand, if the ideal standard of education is high, in any community, means will be found and representatives chosen to realize that ideal.

On the conviction of the people, therefore, the perfection of the school-system depends, and no structure has any stability if its educational results are too complicated or too subtle for popular recognition.

From this we deduce our statement regarding the most important duty of the superintendent. The superintendent is a specialist in matters of education. The community has chosen him and set him over a special department, namely, the direction of its schools. He has the best opportunity to learn what the school ought to do for the children of the people, and he can discover the best measures for its accomplishment.

Having, as a specialist, to conceive an ideal of excellence in his department, he has a two-fold duty remaining to perform: he must realize this ideal in the administration of the details of his system, and he must educate popular opinion in his community to appreciate and support that ideal.

The superintendent cannot consider too carefully the last item of his list of duties. *He must make his educational ideal valid in and through the conviction of the people*, and never allow himself to suppose that he has discharged his duties when he has discovered the educational needs of the people and organized the details of an efficient system to supply those needs.

It is unfortunate for the cause of education that so many excellent superintendents have neglected this third duty, and have even

* Written for the Superintendent's Section of the National Educational Association, March, 1882.

rejected its requirements as unworthy of attention from men with a high sense of honor. They have seen the political demagogue and his base flattery of the passions of the multitude, — corrupting them for the sake of perpetuating his own selfish power. An appeal to the people, — any means used to influence the people directly, — seems, therefore, to be objectionable on the score of demagoguery.

Holding this view, our able superintendent devotes himself to discovering educational wants and perfecting his work of instruction and discipline, and he haughtily demands the support of the community and expects their confidence as a matter of right and of just due to himself. If the people take a different view and are dissatisfied with his exercise of power, and in the end overthrow his establishment, he assumes the air of a martyr and finds his consolation in enumerating the petty circumstances of his persecution by low-minded enemies, while he was pursuing the strict and narrow path of duty. The people who removed him simply call him impractical, and relate a few instances of his stubbornness in carrying out his abstract regulations where they conflicted with the customs and usages of the community. He insisted on applying his abstract rule of industry for all the children in cases where study at home ruined the eyesight of Mr. A's son, or regularity and punctuality were insisted on so strenuously that Mr. B's daughters would go to school when not fully recovered from a fever, and the consequence is the death of one of them; — or in order to preserve the furniture of the new school-house from the wear incident to use by children not seated for study as in regular school-hours, an abstract rule required all pupils to remain in the open air until the bell rung at five minutes before nine o'clock, when all pupils were ranked in lines in the school-yard and marched into the building in military order. This being rigidly adhered to, a very inclement morning caused much suffering and some cases of severe illness.

These are serious evidences of impracticability,—" of a lack of common sense," as the people will tell you. But even when the teacher or superintendent is very discreet in all matters of administration of the schools, if the parents feel themselves treated without respect and due consideration they will misinterpret his motives in a multitude of instances, and accept an unfair account of much that he has done, and thus come to view him as lacking disinterested regard for duty, or else as lacking common sense. ("Common sense" differs from the other kind of "sense" in taking into consideration all the circumstances of the thing, — all that has interest in *common* with the thing, — while the lack of common sense shows itself in the ten-

dency to view its own subject of interest out of its proper relations to the rest of the world; it gets so close to its object that it is exaggerated by the perspective, and the great world is hidden from view by the mole-hill in the foreground.)

The educator who lays all this stress on his first and second duties above-named, and neglects the third one, — that of educating public opinion, — is like the architect who draws an excellent plan on paper and forthwith builds a beautiful structure with hewn stone and the best of mortar, but who has neglected the preparation of a proper foundation. After a short time cracks begin to appear in the walls, the structure becomes dangerous and must be pulled down. In order to complete our comparison we must imagine our architect extolling the merits of his plans and the convenience of his building for human uses, — it was a thoroughly rational contrivance to shelter man from the elements and give him light, heat, and ventilation, and room for all his needs; what a calamity, therefore, that it must now be pulled down! That he should not recognize the necessity of planning and building with reference to the foundation as well as with reference to the human uses for which the building is erected, would totally unfit him for the business of architect and builder. But there are many educators who cannot see that the superintendent should look constantly to the basis of the institution under his charge, and build all his improvements on the foundation of the convictions of the people, and take care to buttress all the walls of his educational system upon distinct and explicit recognition on the part of both parents and pupils. In our country and time no system of managing an institution will achieve a permanent success unless it is based upon, and interprets correctly, the instincts and convictions of the people, and unless it is made to *seem* to the people what it is in reality.

"Three things govern the world," says Gœthe: "Strength, Wisdom, and Appearance." Wisdom is correct insight; Strength is the reality of being; Appearance is the *seeming* of being; and whether false or true, seeming will furnish the foundation for practical action. False appearance will lead to impotent deeds; true appearance alone will furnish a basis for positive, rational deeds. Love and wisdom will not diffuse themselves for the blessing of mankind unless their mode and manner of *appearance* is looked after, and unless the appearance or mode of manifestation of their recipients or objects,—that is to say, unless the concrete shapes of public opinion are understood and interpreted.

After the battle of Valmy, in which Gœthe saw, with his own eyes,

the first defeat of allied monarchical power by insurgent French democ racy, he said to the officers of the defeated Prussian corps with whom he had approached the position of the enemy that morning: "From this place and from this day forth commences a new era in the world's history, and you can all say that you were present at its birth."*

His thought was this: Henceforth it shall not be sufficient for the governing power to rule, even though it rule wisely, if it decides its course apart from the counsels of the people. Henceforth in the history of this world it shall become more and more necessary to take into account the convictions and desires of even the lowest stratum of the people.

The lower the stratum of the people, the less power they have to penetrate the disguise of appearance and see the true reality.

This makes it all the more necessary to see that the appearance of what is true and good is not mistaken by humanity, and in its place the false and evil adopted because it has put on the guise of the true and good, and masquerades under its appearance. We must do right, and also make it seem to be the right. He who educates the people to recognize the right by its appearance, and under its marks and guises, does as good a service to the world as he who merely discovers the right, or who merely organizes it into an institution.

In discussing any topic relating to the duties of a superintendent of schools, therefore, it is necessary to keep in mind this three-fold nature of his work. By the light of its principle we shall find the solution of many difficult problems that beset the administration of the affairs of education.

I have been led to make this general disquisition on the scope of the work of the director of educational interests, because the question assigned to me for discussion before your honored Association on this occasion is one that cannot be discussed profitably without a just appreciation of the third principle in the three-fold duty of the superintendent.

I therefore announce, as the general form of my answer to the question: How can we improve the qualifications of teachers? Bring them to feel by all legitimate means and influences the importance of making themselves strong with their community.

They must teach well, and this includes good instruction and good discipline. They must conduct the school well, and this includes not only a proper reference of their work to the regulations of superintendents and school-directors, but that most important matter of edu-

* "Campaign in France:" Goethe's Diary for Sept. 22, 1792. Quoted by Creasy: "Decisive Battles of the World," p. 343.

cating the community at large into a critical knowledge of the quality of a good school.

At first thought the teacher would be supposed to have enough to do if he attended simply to matters of discipline and instruction. In order to reach and largely influence parents, one would believe it necessary to visit the parents often, and this would consume so much time and energy on the part of the teacher as to seriously weaken his fund of strength left for the work of instruction and discipline. But, in fact, it is not expected of the teacher that he shall make a system of visiting parents; such a course would be likely to diminish his influence. It is through the children themselves that the parents are best influenced. The teacher who is careless of the opinion of parents, and who feels no direct responsibility to them, governs his school in a very different manner from that of him who keeps the sense of the community constantly before him. Every teacher comes into relations with the parents of his pupils oftenest, as far as personal interviews go, through the failures of his pupils.

Irregularity of attendance, want of punctuality, idleness, backwardness in scholarship, and improper behavior are occasions for consultations with the parent. The polite request of the teacher, made in a manner indicating interest in the pupil's welfare from the point of view which the parent ought to take and does take, will nearly always secure the prompt attention of the parent and his cordial coöperation. The coöperation of the parent removes most of the difficulty of managing pupils.

A comparatively small number of personal interviews suffice to establish the reputation of the teacher for good or bad among the parents of his district. One case of arbitrary exercise of authority, or one case of ungoverned temper on the part of the teacher, will be remembered by all who hear of it, — and all will hear of it. Each parent takes to himself what is done to any one parent just as each pupil trembles at the punishment inflicted on any one of his fellows, and perhaps the good pupils suffer more than the bad ones through imagining themselves to be in like circumstances with the culprit.

A sense of responsibility to the good opinion and moral support of the parents in the community makes itself felt on slight occasions and soon gets recognized by all and gives rise to mutual confidence. The influence upon the pupil of a knowledge that a mutual respect exists between the teacher and his parents is exceedingly beneficial.

Whatever is done at school is reported at home, though not directly by the children of the family. The parents form an opinion of the teacher through the fragmentary reports of their children, and

that opinion reacts directly on the behavior of the pupils. The experienced teacher who has long been in the habit of looking beyond his pupils to the families they represent, has learned how to mould opinion at home through the impressions he leaves on the minds of his pupils.

The superintendent can do no greater service for his teachers than to develop in them this habit of considering all their instruction and discipline as having an indirect relation through the pupils to the parents; and again, a still further reaction upon the pupils which affects them permanently. The wise teacher will not waste his efforts in an impulse on his pupils that will be neutralized at once by the parents. He will find a way of educating the parents by a series of indirect lessons.

These matters of relation of the teacher toward parents are very important, but they depend more on the impulse of the teacher than on the efforts of the superintendent.

There are, however, many devices of school management entirely within the control of the superintendent which may be used for the improvement of the quality of teachers' work.

I will mention, first, *the suspension of pupils.* This may happen for irregularity of attendance, or for disobedience. Suspension is not expulsion. The teacher should not exercise the power of expulsion. Suspension means simply that the pupil has in some way violated the rules of the school in a serious manner, and that the case is referred to the superintendent who will restore the pupil upon the application of the parent. This brings about a meeting between the parent and superintendent, who must always be conciliatory toward the parent. It is the great mistake of some superintendents that they assume a browbeating air toward the parents of pupils who have been suspended. If the parent is punished in that manner, the pupil's cause has become the parent's cause, and the effect is lost on the pupil.

The parent must be free to complain to the superintendent in regard to the conduct of the teacher, but the superintendent will hold his own counsel. In this way sometimes the fact will be revealed that the parent has lost confidence in the justice or ability of the teacher. In that case the child cannot be expected to profit by the instruction he will receive in that school, but will be a source of insubordination and a destroyer of sympathetic relations between the teacher and other pupils. The superintendent will explain this condition of things to the parent, and urge strongly the transfer of the pupil to some other school in the neighborhood. If the parent

insists on retaining the pupil in the same school, he will then see the necessity of correcting his alienation toward the teacher, and will consent to a personal interview, Under most circumstances transfer of the pupil to another school is the best course. Transferred pupils come among strangers (both pupils and teachers), and they have the best of opportunities to begin a new career. The parent is also far more apt to frown on a repetition of an offence by his child in the new school, — he now suspects that the original difficulty was the fault of his own child instead of the fault of the former teacher. The child gets no sympathy at home for his misbehavior, and finds obedience the easiest course at school. But the recurrence of trouble at school on the part of a pupil, after a case of suspension and restoration to the same school, is more likely to be accounted for by the parent as a case of grudge on the part of the teacher.

It is a common practice in our cities to have rigid district lines, separating one school from another. It is thought that pupils should never be transferred from one district to another. This habit of preserving strict lines costs a fearful price. The collisions between the teacher and the pupils and parents ripen into feuds and continue to accumulate, with interest, from year to year, while by the plan of transfers they are neutralized at their inception and a strong attachment arises for each school on the part of all its patrons.

There is no better preventive or remedy for the evil of irritability on the part of the teacher than this device of transfer to other schools in case of severe complaint on the part of the parents.

The teacher is made aware of the effects of his or her irritability, and at the same time of responsibility to the community.

The peculiarity of the teacher's vocation,—his being obliged to deal with immature minds, and especially with undeveloped wills subject to fits of caprice and irrationality, — the very nature of the teacher's vocation tends to produce dogmatism and irritability. The superintendent must therefore organize all his means so as to counteract this tendency, and protect the teacher against the effects of his own vocation.

Of course, it will be conceded that professional training in a good school is the best preparation for the new teacher. I have made repeated examinations of the comparative merits of normal-school graduates and other teachers. The result has proved to be in favor of the normal schools by almost fifty per cent. in quality of work. The criterion has been the estimate reported on the teacher's work by the principal of the school and confirmed by the superintendent. Promotions for merit have been doubly in favor of the normal grad-

uates. The average teacher stops growing within a short period after achieving fair success, — three to five years being the ordinary limit fixed. The teacher educated at a normal school is more likely to continue grow ing throughout the entire career.

The best device for the initiation of new teachers, whether from the normal school or elsewhere, is what is known in cities as "substituting." The new teacher is sent to fill temporary vacancies as they occur. If a partial failure is made, and demoralization takes place on the part of the pupils, the evil is soon remedied by the return of the regular teacher. Meanwhile the teacher goes to fill some other vacancy, with a store of valuable experience acquired. It is very difficult for a young teacher to recover control of a school-room after it has been lost by the mistakes of inexperience. The plan of sending out such inexperienced teachers as substitutes not only makes them successful in a far less time, but it positively saves many from complete discouragement and ultimate failure.

I have known many teachers of long experience, but wretched failures after all their experience, who have become good teachers after being employed a few weeks as substitutes.

This practice of sending substitutes to fill vacancies is made more effective in improving the qualifications of teachers by the organization of schools in groups and placing them under supervisory principals. The supervisory principal can manage a system including twenty to thirty subordinate teachers. His work differs from the su-superintendent's in the fact that he is required to hear at least two regular recitations daily,—a circumstance which keeps his supervision at the point of view of the teacher, and makes it differ widely from the supervision of the superintendent.

The links of supervision, when developed fully in a large city, are three in number and very different in kind. The general superintendent is best qualified to detect one-sided tendencies in instruction and discipline, and to take note of the trend of public opinion, give advice to the school-board, etc. The assistant superintendents study details of management more closely and give more stimulus to the application of special methods and the correction of defects in practice. The supervising principal can give daily support to a teacher that is failing in discipline or instruction, and can conduct classes in the presence of the teacher, and demonstrate the best methods of instruction as well as prevent too harsh discipline by having the flagrant cases sent up to him for correction. These flagrant cases he can usually reform by keeping a record of them and having the same pupil bring up a daily record of his behavior from his teacher, until

he succeeds in attaining a perfect record for several days in succession.

There is still another very important means of improving the quality of instruction, by introducing into the course of study a certain amount of work to be done orally. The pupil is to have no text-book and have no previous preparation in these lessons. The teacher must make elaborate preparation and furnish the pupil information, and at the same time, by conversation, connect this new material with related objects that have already come into the child's experience.

The oral lessons should not be given on work that the child is competent to master by his own study, — such as the disciplinary studies, reading, arithmetic, geography, and grammar. But they should relate to the sciences of nature and to civil history, — nature and man.

Inasmuch as the preparation by the teacher must be elaborate, there should be not more than two of these oral lessons a week.

It has been a great mistake to introduce these oral lessons every day. The teacher has been unable to meet the strain on his energies, and has been obliged to come to the lessons unprepared.

With one long lesson a week in natural science and one in history the teacher makes weekly preparation, and gradually becomes well informed in all departments of natural science and civil history. A teacher continually growing in knowledge of the world will continually improve as a teacher.

This oral work stands in sharp contrast to the regular text-book work. Its results, however, continue to reappear in the greater interest which the teacher infuses into the recitation from the text-book. His ability to cross-question and to bring out into clearness all phases of the subject continue to develop.

There is, and must be, a periodical recurrence of a demand on the part of the public for the introduction of lessons in natural science and history into the course of study.

These are information-studies, contrasted with reading, writing, arithmetic, grammar, and geography as discipline-studies, and their methods should be very different. Then they will be mutually helpful. All text-book instruction tends to degenerate into parrot-like repetition of words without investigation of the meaning. All oral instruction tends to degenerate into a pouring-in process for the pupil, giving him amusement and saving the head-work for the teacher alone.

The school should not give up its information-studies because the

people cease to clamor for them, nor introduce them at the expense of discipine-studies when extremists demand it.

The superintendent must be conservative in action and conservative likewise in reaction.

Another very important matter in improving the qualifications of teachers is the system of promotions and the grading of salaries. There should be opportunity given for the reward of professional zeal and successful experience. The recognition of this by promotion to positions of greater responsibility and dignity is as important as the recognition of it by increase of salary. The growing teacher rejoices in new responsibilities and duties. The new situation furnishes new problems and new applications of skill. The consciousness of growth in spiritual capacity is the highest satisfaction which man can attain. All teachers can grow, or improve in their profession, and must do so for a few years. if only a few years. The grading of promotions and salaries should be such as to recognize four or five years of growth in the position of ordinary assistants; then there should be three or four classes of assistants; there should also be several classes of principals of schools, although the last point is not to be affirmed without mental reservations.

In a school with many grades of pupils, from beginners up to the seventh or eighth year of school work, it is easy to say where positions of responsibility and honor should be fixed. The teacher who has charge of the children just beginning school should receive a higher salary and be selected because of approved experience in the management of young children. In large schools of this character, (schools having seven to nine hundred pupils) there should be two teachers of higher grade to do this work, — one might be a single grade higher and the other one two grades higher. Again, at the point near the finishing of the school course there should be teachers of higher grade to do the work. The starting of pupils on the right track, and the finishing of the course, are the two most important points where we desire a specially able teacher, if we are bound to select two points from a line where we desire all to be good. The first teacher does much to form habits of proper study and proper attention in recitation that no other teacher can do quite as well. The teacher of the highest grade does much for the motives and aspirations with which the pupil is to go forth to the next grade of his education, be it school or business. To the highest assistant is assigned the control of the entire school in place of the principal, in case of his absence. The exercise of directive power is recognized as implying higher dignity and as earning a more liberal recompense.

It is a healthy stimulus in life to look forward to an increase of salary and promotion in rank, as a natural consequence of persistence in one's vocation, and of successful experience.

The chance to rise in one's profession is a powerful incentive to good work. It is so in the case of the teacher even to a special degree. The teacher is a person likely to have a susceptible temperament, — easily aroused or depressed. I find that promotions in rank and the just grading of salaries,—proportioning the same to length of service and to success actually achieved,— constitute the best of appliances for the improvement of teachers.

THE NEED OF MORE PRACTICAL AIMS AND METHODS IN COLLEGE WORK.*

BY R. F. LEIGHTON, PH.D., BROOKLYN, N. Y.

INFLUENCED by the feelings which this presence inspires it is natural that we should revert to the character and general process of that academic training the benefits of which we have enjoyed, and at the same time inquire how far it has been modified or enlarged to adapt it to the changed and changing circumstances of life that confront us to-day. There is no question but that the past twenty years have been of unprecedented activity, and have witnessed changes in all the varied and vast industries of life that require readjustments and corresponding changes in the courses of study and methods of instruction in our institutions of learning. The education that was ample fifty years ago is now insufficient. The man who steps into the busy activities of life to-day must be better equipped for the sharper conflicts and keener rivalries, or failure awaits him. In fact the general diffusion of higher education has destroyed the old ideal of self-made men,—as one who should begin in ignorance and accomplish all he does by means of that ignorance. The time has come when that idol is broken, and to-day "the truly self-made man is he who begins, it may be as of old, from the beginning, but who goes through college, and accomplishes with cultured mind the best results." The very nature of our civilization, — its varied life and industries, the diversified applications of science and art, — requires enlarged opportunities for education, that colleges and high-schools alone can afford. Statesmen have begun to realize that skill in the arts of invention, and discovery in the processes and economies of production, depend in a great measure on the thorough and earnest work of the schools. In short, a multiplicity of influences, — the easy intercourse with foreign countries, the multiplication of cheap books which have furnished important auxiliaries to every other instrument of education, the press teeming with the choicest and best thoughts of the age, — have wonderfully facilitated the diffusion of knowledge among all classes, and have contributed as one general system to instruct and discipline the mind of the age. This wide diffusion of knowledge among the masses has in turn reacted upon our colleges, higher institutions of learning, and especially upon our common schools, de-

* Read before the Alumni Association of Tuft's College.

manding of them a more liberal, practical, and thorough training. The discussions, the sharp criticisms, the "attacks all along the line," to which our common school system has been subjected during the past twenty years have shown its deficiencies, its many radical defects, and have very generally brought about a readjustment of methods and a better adaptation of the work to the practical needs of life. A wonderful interest has been awakened on all sides in the subject of popular education as the pillar and safeguard of republican institutions, and because of that interest the common schools are doing their work more efficiently than ever before.

While these needful and salutary changes have been made in our system of general education, there is still a widespread feeling that the course of study and methods of instruction in our colleges have not kept pace with the general progress of elementary education, and, in a large measure, fail to meet the new and more exacting demands of the age, and do not produce the most perfect development of the mental powers, nor, indeed, furnish that practical help in after-life which such a course of study ought to supply. Herbert Spencer best tells us the use of an education: "To prepare us for complete living is the function which education has to discharge: in what way to treat the body; in what way to treat the mind; in what way to manage our affairs; in what way to bring up a family; in what way to behave as a citizen; in what way to utilize all the sources of happiness which nature supplies; how to use all our faculties to the greatest advantage to ourselves and others, — how to live completely." Now, many people think that the results accruing from a collegiate education not only do not answer these ends, but, viewed from a much lower standpoint, are insufficient and unsatisfactory, and do not even correspond to the outlay of time and money; that too many emerge from the walls of our colleges, poorly equipped for future work of any kind; that there culture is made an object of itself, and that, by insufficient means and desultory study, the mind is little fitted to cope with the actual difficulties of life. The establishment of technical schools and special courses to supplement in a measure these deficiencies that are so apparent in college work is an evidence that the ordinary college curriculum does not afford sufficient opportunity for this useful and practical training which the work of life demands. The theory on which a curriculum of study ought to be founded would seem to be, that certain studies are best fitted to prepare one for the duties of life.

What, therefore, best equips a man in general for these duties, — and by this I mean whatever knowledge gives intelligence, whatever

reacts upon the mind in such a way as to feed and quicken all its energies, whatever converts the mind into a powerful instrument for its possessor to wield in the activities of life, — that is evidently the path to a complete and generous education for that person. Now, the fact is incontestable that every man is born with capacities that give him readier access to certain circles of knowledge than to others. While a broad view of culture may demand that the mind shall not be a stranger to any part of the great circle of knowledge, experience teaches us that the human faculties are limited, and that there are few capacities sufficient to grasp the whole range of knowledge. While one individual gains access to intellectual life and vital knowledge through the study of the sciences or of mathematics, another can gain that access only through the study of language and literature. Discipline ought not to be pressed as an end in itself, and above all no student ought to pursue a line of study beyond the preparatory stage, for which he has no taste, and at the risk of keeping the mind from the knowledge which is congenial to it, and which will eventually react upon it, and quicken all its energies. While the beginnings of a liberal education ought to be the same for all, and its foundation thoroughly laid, the college should aim to give that practical training so necessary to cope with the duties of life, that insight into questions of finance, that close study of political history, that comprehension of the general and comparative principles of political economy, bringing with it a necessary consideration of questions pertaining to the relations of capital and labor, of taxation to the general welfare, that thorough and special study of jurisprudence and international law, all of which would train a class of men competent to deal with these industrial, commercial, financial, legislative, social, educational questions which are pressing to the front and which have hitherto been too often the sport and experiment of every demagogue. It is the knowledge gained by the special aptitudes born in every one which, after all, is the only truly disciplinary knowledge that tells in the long run. No student, then, should be required to devote the early years of manhood to studies for which he has no special capacity, and which he thinks conveys no information directly useful for life. "Insist on yourself," says Emerson. "Your own gift you can present every moment with the cumulative force of a whole life's cultivation; but of the adopted talent of another you have only an extemporaneous, half possession. That which each can do best none but his Maker can teach him. No man yet knows what it is, nor can, till that person has exhibited it. Where is the master who could have instructed Franklin, or Washington, or Bacon, or Newton?

Every man is a unique." With the present methods of college instruction and organization, the student is compelled, at an age when he ought to be forming the valuable connections of life, to enter upon a course * of special professional preparation. "The increase in the requisition for admission to college which has been going on steadily," says President Eliot, "for many years, has the tendency to raise the age of admission." According to the same report the average age for the last few years has been eighteen years and five months. How few can spend so long a time in preparation, especially when the college course† must be supplemented by two or three years of special professional training. It is evident that such a scheme has no regard for the exigencies of common life, and must result either in limiting the advantages of college training to an increasingly smaller number, or in shortening the period of professional preparation. A change of some kind must come, from the very fact that life is too short for the requirements of such a course of study. Hence, men who take a hard, practical view of life no longer send their sons to college, but look about for an opportunity where they can pursue special lines of study for one or two years before entering business; and so, boys who might have a college training up to eighteen or to nineteen are put to work at sixteen or seventeen. Wise men lament over the decline of culture, and sermons are preached against the lust of mammon;‡ but the fact remains, according to the statistics collected by President Barnard, that the proportion of college-bred men is growing perceptibly less in this country.§

* Prof. Gildersleeve, in an article printed in the Princeton Review, on "Classics and Colleges," has some very valuable and instructive suggestions on this subject.

† Everett, Motley, and Bancroft entered college at thirteen; Lowell at sixteen; Morse and Woolsey at fifteen; N. P. Willis and Porter at sixteen; Webster at fifteen; Chase and Choate at sixteen; Whitney at fourteen.

It will, of course, be urged that the requirements for admission have been very considerably advanced since these men entered college. Their success in life shows that they were not so poorly equipped as some would have us believe who extol the present advance in the standard. Again, the "objection may be raised that they are picked men; but it does not follow, because they are picked men that they were precocious men; and it is very evident that they represent the average age." — *Prof. Gildersleeve, l. c., p.* 84.

‡ For some excellent remarks on this subject see "Colleges and Classics" by Prof. Gildersleeve.

§ According to President Barnard's statistics ("Academic Degrees"), p. 10 f., the number of undergraduates in all our colleges were (in 1870) 15,000. In Germany, not to count those in the technical and mining schools, there were over 19,000 university students; in France, 11,903. From a very careful estimate of the number of under-graduates in all the colleges between 1840 and 1870, it will be seen from the following table, that relatively to the total population of the country, they have diminished: In 1840, one to 1,549; in 1850, one to 2,012; in 1870, one to 2,273; in 1880, one to 3,000. Estimating the present

When the great movement that preceded and caused the Renascence swept over Europe, and men became aware of the marvels of literature and the beauties of the external world, the courses of study and the methods of instruction in the schools had to be readjusted to meet the changed circumstances of the times. The universities of England, which have very generally served as our models of college government and organization, stood aloof from these changes and, therefore, felt little power from the Renascence.* Lord Bacon ridiculed the great universities of his day for teaching men to believe rather than to think, and compared them to becalmed ships with their sails idly drooping, waiting to be moved by the wind of current opinion and refusing to dip their oars and to become a vital force. We have again entered upon a new era, one distinguished from all preceding ages in being intensely practical. Our colleges, although they have introduced important and radical changes sometimes in the course of study, more often in the general management, that they might the better answer the demands of public opinion, are still subjected to severe and persistent criticism, and are too often feeling the lack of public confidence in the decrease of attendance and in the difficulty of obtaining funds to carry even the proposed changes into efficient execution, because men are looking for greater returns where so much has been already invested. As these changes have not fulfilled the predictions that were so confidently made, have not even answered in a measure public expectation, some of our college authorities, — conversant, it would seem, with the fact that deep dissatisfaction prevails in England in regard to college and university educa-

population at 45,000,000, gives about 15,000 (the number in 1840 was 9,416; in 1860, 13,661) as the total number of under-graduates in all the colleges of the country.

The ratio of students to population in New England for several epochs is given in the following table:

1827.	1839.	1856.	1870.	1880.
1 : 1,513	1 : 1,294	1 : 1,689	1 : 1,927	1 : 2,200

Again, in 1830 the number of colleges was 120; the number according to the latest enumeration (Prof. Nightingale) is 425, or excluding Catholic colleges, 355. The population in 1830 was 12,000,000. It is now about 45,000,000; *i. e.* the population has increased nearly fourfold, the number of colleges threefold, and the number of students twofold. The average attendance in 1830 was 67; in 1870, 44; and in 1880, about 40.

* The Renascence had far less power in the schools of England than in those of Germany. In Germany the Renascence and Reformation triumphed together, and entered the schools together. The leading reformers were at the same time the leading men in intellect and culture. In England the power of the Reformation and Renascence was separate. The Reformation triumphed and got possession of the schools, but unfortunately the reformers were men of the second order. The men of intellect and culture were men of the Renascence but not of the Reformation. Hence the schools in England received far less impetus from this source than those in Germany.

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THE NEED OF MORE PRACTICAL AIMS AND METHODS IN COLLEGE WORK.*

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INFLUENCED by the feelings which this presence inspires it is natural that we should revert to the character and general process of that academic training the benefits of which we have enjoyed, and at the same time inquire how far it has been modified or enlarged to adapt it to the changed and changing circumstances of life that confront us to-day. There is no question but that the past twenty years have been of unprecedented activity, and have witnessed changes in all the varied and vast industries of life that require readjustments and corresponding changes in the courses of study and methods of instruction in our institutions of learning. The education that was ample fifty years ago is now insufficient. The man who steps into the busy activities of life to-day must be better equipped for the sharper conflicts and keener rivalries, or failure awaits him. In fact the general diffusion of higher education has destroyed the old ideal of self-made men,—as one who should begin in ignorance and accomplish all he does by means of that ignorance. The time has come when that idol is broken, and to-day "the truly self-made man is he who begins, it may be as of old, from the beginning, but who goes through college, and accomplishes with cultured mind the best results." The very nature of our civilization, — its varied life and industries, the diversified applications of science and art, — requires enlarged opportunities for education, that colleges and high-schools alone can afford. Statesmen have begun to realize that skill in the arts of invention, and discovery in the processes and economies of production, depend in a great measure on the thorough and earnest work of the schools. In short, a multiplicity of influences, — the easy intercourse with foreign countries, the multiplication of cheap books which have furnished important auxiliaries to every other instrument of education, the press teeming with the choicest and best thoughts of the age, — have wonderfully facilitated the diffusion of knowledge among all classes, and have contributed as one general system to instruct and discipline the mind of the age. This wide diffusion of knowledge among the masses has in turn reacted upon our colleges, higher institutions of learning, and especially upon our common schools, de-

* Read before the Alumni Association of Tuft's College.

manding of them a more liberal, practical, and thorough training. The discussions, the sharp criticisms, the "attacks all along the line," to which our common school system has been subjected during the past twenty years have shown its deficiencies, its many radical defects, and have very generally brought about a readjustment of methods and a better adaptation of the work to the practical needs of life. A wonderful interest has been awakened on all sides in the subject of popular education as the pillar and safeguard of republican institutions, and because of that interest the common schools are doing their work more efficiently than ever before.

While these needful and salutary changes have been made in our system of general education, there is still a widespread feeling that the course of study and methods of instruction in our colleges have not kept pace with the general progress of elementary education, and, in a large measure, fail to meet the new and more exacting demands of the age, and do not produce the most perfect development of the mental powers, nor, indeed, furnish that practical help in after-life which such a course of study ought to supply. Herbert Spencer best tells us the use of an education: "To prepare us for complete living is the function which education has to discharge: in what way to treat the body; in what way to treat the mind; in what way to manage our affairs; in what way to bring up a family; in what way to behave as a citizen; in what way to utilize all the sources of happiness which nature supplies; how to use all our faculties to the greatest advantage to ourselves and others, — how to live completely." Now, many people think that the results accruing from a collegiate education not only do not answer these ends, but, viewed from a much lower standpoint, are insufficient and unsatisfactory, and do not even correspond to the outlay of time and money; that too many emerge from the walls of our colleges, poorly equipped for future work of any kind; that there culture is made an object of itself, and that, by insufficient means and desultory study, the mind is little fitted to cope with the actual difficulties of life. The establishment of technical schools and special courses to supplement in a measure these deficiencies that are so apparent in college work is an evidence that the ordinary college curriculum does not afford sufficient opportunity for this useful and practical training which the work of life demands. The theory on which a curriculum of study ought to be founded would seem to be, that certain studies are best fitted to prepare one for the duties of life.

What, therefore, best equips a man in general for these duties, — and by this I mean whatever knowledge gives intelligence, whatever

reacts upon the mind in such a way as to feed and quicken all its energies, whatever converts the mind into a powerful instrument for its possessor to wield in the activities of life, — that is evidently the path to a complete and generous education for that person. Now, the fact is incontestable that every man is born with capacities that give him readier access to certain circles of knowledge than to others. While a broad view of culture may demand that the mind shall not be a stranger to any part of the great circle of knowledge, experience teaches us that the human faculties are limited, and that there are few capacities sufficient to grasp the whole range of knowledge. While one individual gains access to intellectual life and vital knowledge through the study of the sciences or of mathematics, another can gain that access only through the study of language and literature. Discipline ought not to be pressed as an end in itself, and above all no student ought to pursue a line of study beyond the preparatory stage, for which he has no taste, and at the risk of keeping the mind from the knowledge which is congenial to it, and which will eventually react upon it, and quicken all its energies. While the beginnings of a liberal education ought to be the same for all, and its foundation thoroughly laid, the college should aim to give that practical training so necessary to cope with the duties of life, that insight into questions of finance, that close study of political history, that comprehension of the general and comparative principles of political economy, bringing with it a necessary consideration of questions pertaining to the relations of capital and labor, of taxation to the general welfare, that thorough and special study of jurisprudence and international law, all of which would train a class of men competent to deal with these industrial, commercial, financial, legislative, social, educational questions which are pressing to the front and which have hitherto been too often the sport and experiment of every demagogue. It is the knowledge gained by the special aptitudes born in every one which, after all, is the only truly disciplinary knowledge that tells in the long run. No student, then, should be required to devote the early years of manhood to studies for which he has no special capacity, and which he thinks conveys no information directly useful for life. "Insist on yourself," says Emerson. "Your own gift you can present every moment with the cumulative force of a whole life's cultivation ; but of the adopted talent of another you have only an extemporaneous, half possession. That which each can do best none but his Maker can teach him. No man yet knows what it is, nor can, till that person has exhibited it. Where is the master who could have instructed Franklin, or Washington, or Bacon, or Newton?

Every man is a unique." With the present methods of college instruction and organization, the student is compelled, at an age when he ought to be forming the valuable connections of life, to enter upon a course* of special professional preparation. "The increase in the requisition for admission to college which has been going on steadily," says President Eliot, "for many years, has the tendency to raise the age of admission." According to the same report the average age for the last few years has been eighteen years and five months. How few can spend so long a time in preparation, especially when the college course† must be supplemented by two or three years of special professional training. It is evident that such a scheme has no regard for the exigencies of common life, and must result either in limiting the advantages of college training to an increasingly smaller number, or in shortening the period of professional preparation. A change of some kind must come, from the very fact that life is too short for the requirements of such a course of study. Hence, men who take a hard, practical view of life no longer send their sons to college, but look about for an opportunity where they can pursue special lines of study for one or two years before entering business; and so, boys who might have a college training up to eighteen or to nineteen are put to work at sixteen or seventeen. Wise men lament over the decline of culture, and sermons are preached against the lust of mammon;‡ but the fact remains, according to the statistics collected by President Barnard, that the proportion of college-bred men is growing perceptibly less in this country.§

* Prof. Gildersleeve, in an article printed in the Princeton Review, on "Classics and Colleges," has some very valuable and instructive suggestions on this subject.

† Everett, Motley, and Bancroft entered college at thirteen; Lowell at sixteen; Morse and Woolsey at fifteen; N. P. Willis and Porter at sixteen; Webster at fifteen; Chase and Choate at sixteen; Whitney at fourteen.

It will, of course, be urged that the requirements for admission have been very considerably advanced since these men entered college. Their success in life shows that they were not so poorly equipped as some would have us believe who extol the present advance in the standard. Again, the "objection may be raised that they are picked men; but it does not follow, because they are picked men that they were precocious men; and it is very evident that they represent the average age." — *Prof. Gildersleeve, l. c., p.* 84.

‡ For some excellent remarks on this subject see "Colleges and Classics" by Prof. Gildersleeve.

§ According to President Barnard's statistics ("Academic Degrees"), p. 10 f., the number of undergraduates in all our colleges were (in 1870) 15,000. In Germany, not to count those in the technical and mining schools, there were over 19,000 university students; in France, 11,903. From a very careful estimate of the number of under-graduates in all the colleges between 1840 and 1870, it will be seen from the following table, that relatively to the total population of the country, they have diminished: In 1840, one to 1,549; in 1860, one to 2,012; in 1870, one to 2,615; in 1880, one to 3,000. Estimating the present

When the great movement that preceded and caused the Renascence swept over Europe, and men became aware of the marvels of literature and the beauties of the external world, the courses of study and the methods of instruction in the schools had to be readjusted to meet the changed circumstances of the times. The universities of England, which have very generally served as our models of college government and organization, stood aloof from these changes and, therefore, felt little power from the Renascence.* Lord Bacon ridiculed the great universities of his day for teaching men to believe rather than to think, and compared them to becalmed ships with their sails idly drooping, waiting to be moved by the wind of current opinion and refusing to dip their oars and to become a vital force. We have again entered upon a new era, one distinguished from all preceding ages in being intensely practical. Our colleges, although they have introduced important and radical changes sometimes in the course of study, more often in the general management, that they might the better answer the demands of public opinion, are still subjected to severe and persistent criticism, and are too often feeling the lack of public confidence in the decrease of attendance and in the difficulty of obtaining funds to carry even the proposed changes into efficient execution, because men are looking for greater returns where so much has been already invested. As these changes have not fulfilled the predictions that were so confidently made, have not even answered in a measure public expectation, some of our college authorities, — conversant, it would seem, with the fact that deep dissatisfaction prevails in England in regard to college and university educa-

population at 45,000,000, gives about 15,000 (the number in 1840 was 9,416; in 1860, 13,661) as the total number of under-graduates in all the colleges of the country.

The ratio of students to population in New England for several epochs is given in the following table:

1827.	1839.	1856.	1870.	1880.
1 : 1,513	1 : 1,294	1 : 1,689	1 : 1,927	1 : 2,200

Again, in 1830 the number of colleges was 120; the number according to the latest enumeration (Prof. Nigntingale) is 425, or excluding Catholic colleges, 355. The population in 1830 was 12,000,000. It is now about 45,000,000; *i. e.* the population has increased nearly fourfold, the number of colleges threefold, and the number of students twofold. The average attendance in 1830 was 67; in 1870, 44; and in 1880, about 40.

*The Renascence had far less power in the schools of England than in those of Germany. In Germany the Renascence and Reformation triumphed together, and entered the schools together. The leading reformers were at the same time the leading men in intellect and culture. In England the power of the Reformation and Renascence was separate. The Reformation triumphed and got possession of the schools, but unfortunately the reformers were men of the second order. The men of intellect and culture were men of the Renascence but not of the Reformation. Hence the schools in England received far less impetus from this source than those in Germany.

tion,—have boldly adopted German universities as their model. Hence we too often see college and university methods of instruction jumbled together, with little comprehension of the work which either is fitted to accomplish. Even if we grant that the aim of our colleges is the same as that of the German universities, we ought to be cautious in accepting them as models of college government and instruction, or in regarding their methods of training and discipline as applicable in all respects to our life, particularly when such men as Von Sybel, Lange, Curtius, and others find so much even in their system of education. Still it would be a great gain if, in adopting German universities as our models, we could at the same time introduce German methods of instruction, — the ability, the thoroughness, the patience of the German professor. The German student leaves the gymnasium at about the same age that the American student enters college.* It is true that, so far as mathematics and physics are concerned, the German gymnasium does not present so full a course as the American college, but in other departments the instruction is much more thorough and complete; *i. e.*, in Germany the preparatory drill is completed in the gymnasia in a better manner and four years earlier than in the preparatory schools in this country. At the university the German student enters at once upon university-work, — the technical and professional training, — as the real preparation for life. Some of our colleges realizing such facts as these have attempted to remedy the evil they disclose by carrying on university work by college methods, but the results thus far have not been gratifying. President Porter,† in some interesting papers on the theory and administration of college education, finds the root of the evils in our system of college education in the preparatory schools, — in poor instruction and consequent insufficient preparation for college. It would seem that he overlooks for the moment what all educational experience teaches,—that educational improvements work from the top downward, and, hence, the sure way of improving and elevating the preparatory schools is to apply the remedy first in the colleges. Education is everywhere what the college or university makes it.

I know well that it is much easier to discover faults than to point out a way to amend them; but, at a time when dispondency prevails

* "F. A. Wolf entered the university at nineteen; Gottfried Hermann at fourteen; Niebuhr at seventeen; Boeckh at eighteen; Nitzsch at twenty; Zumpt at seventeen: Schömann at sixteen; Ritschl at nineteen; Holm at seventeen; E. Curtius at nineteen; G. Curtius at eighteen; Corssen at twenty; Tenffel at eighteen, etc. See the list in Freund's Triennium, I. p. 76 f."

† American Colleges and the American Public, p. 74 f.

in so many of our colleges, when dissatisfaction is openly expressed with all, and the large majority of young men who wish to enter upon higher work do so, not at home, but abroad, I am confident that suggestions offered in no unfriendly spirit here, where our hopes and interests so strongly center, will be welcomed. I wish, therefore, to invite your attention briefly to the consideration of the *need of more practical aims and methods in college work*, or to answer indirectly why it is that the German student, with apparently no better natural abilities, completes in a more thorough and satisfactory manner what corresponds to our College course, four years earlier, and his University course, or preparation for the actual work of life, two or three years earlier, than the American student. In fact we have nothing that corresponds in thoroughness and completeness to the University course in Germany.

I wish, in the first place, to guard against the misapprehension that time may be gained by slighting the preparatory work. The student's preparation for college ought to be as thorough and complete as, under the present circumstances, is possible. If, however, the preparation for college is incomplete, let the drill and study be continued during the freshman year; but after that, school-boy work and preparatory methods should give place to something better. During the last three, certainly during the last two, years of college-life, students ought to be doing independent work, and in those special lines of study which they think will be useful in life. It would seem that this want is met by the various elective courses in our colleges, open to all after the freshman year. This elective work, however, is not conducted in the spirit and manner for which I plead, but the same school-boy methods,—the hearing of recitations, the mastery of the text-book,—are continued to a time when scientific study, personal research, and original work ought to find a place. It is no new thing to call in question the methods employed at present in our colleges in teaching the languages, particularly the classical languages. On account of the faulty methods and the meagre results the protest has been most earnest, because it is seen that all classical studies are brought into danger. Starting with the idea that classical learning can be obtained only through the grammar, a dreary grammatical and philological drill, like the philosophy of Albertus Magnus, —the mere introduction to which was of itself enough to absorb the student's whole time,—really guards the access to any large communion with the literature, or vital knowledge of the political and social life of the ancients, as derived from ancient authors. "I know of nothing," says Prof. Bowen, "better calculated to render the pupil

insensible to the beauties of classical literature than to make the words mere pegs on which to hang long disquisitions on the latest refinements in philology." Galileo complained that he could not induce the schoolmen to look through his telescope, for they held that truth could be arrived at only by comparison of manuscripts. Now, classical learning can be obtained only through the grammar. How incomparably greater would be the results accruing from a course of classical study if a competent teacher should bring the student by new methods, by better instruction, by the use of the language in reading and speaking, by a large contact with its literature, to drink in the spirit and zest of antiquity. This would be a knowledge: these would be results that would soon set at rest all questions as to the utility of classical studies. Some object to teaching the classical languages for speaking purposes, both because it is impracticable and because this method of teaching, when applied to the modern languages, belongs to what has been called "The commercial theory of education." Hence, another impetus has been given to the tendency to make education a positive dis-preparation for the proper duties and cares of life. If we do not wish to miss the ultimate object in the study of language, let our aim be to perfect our use and mastery of it as a medium of converse with the literary, historical, philosophical, or artistic sense of the past; to each of which senses we give a chance by treating language as literature, while mere grammatical and philological studies bring vital knowledge to but few. Again, colleges, in so far as they treat their students as mere boys, whether it be in prescribing discipline which may be salutary at fifteen, but is an intolerable nuisance for young men, and which, therefore, indirectly promotes the occasional outbreak of disorder; or, in laying down one course of study for all, thwart in a measure by such management the very aim which young men ought to have in view in acquiring a college education, namely, a "knowledge of themselves and the world," as Matthew Arnold expresses it. Every college student is old enough to form opinions of the relative value of studies, and that he should be encouraged to form such opinions is in every way desirable, is in fact one of the things he ought to do. "What is more desirable," asks Matthew Arnold, "than for the student to consider what subjects are most important for him to study, what knowledge his after-life is likely to demand, what his own intellectual powers and defects are, in what way he may develop the one and correct the other?" In this way every student is compelled to study his own special aptitudes, and then to select those studies through which his access to "vital knowledge

and intellectual life lies." Of late years, in order to give some scope to this faculty of selection, or perhaps with the idea that a college would become a university if the catalogue offered a great variety of courses, there has been a crowding of a vast multiplicity of studies into the college curriculum,—some elective, some compulsory, but of nearly all of which the student is expected, at one time or another, to get a smattering. When we reflect that these "increased facilities" have been offered to the detriment of more thorough and extensive work in special lines of study, it would be well to inquire if the old curriculum had not its advantages, if not in what it did, certainly in what it left undone. It did not, at least, prevent individual expansion by compelling or encouraging the student to dissipate his time in too wide a range of studies. Then, again, we ought to disabuse our minds of the idea that has been of late years too prevalent, that a college can be converted into a university by simply increasing the number of studies and the variety of courses. A university, to be such in reality, must do university work by university methods.

I would solve the difficulty by separating distinctly,—and the bifurcation, as Matthew Arnold calls it, should come at the end of the second college year,— college education and university education.* Their aims and methods are different; the office of the college being to give instruction in prescribed studies, while the university offers a business and professional training. As matters are now managed every college attempts university work in its various elective courses, and that by college methods, and the result has been, and must always be, a failure. Our better colleges could then with advantage, in a two-years course, return to their former aims, which have been too hastily abandoned, of giving an intellectual training which is desirable for every one, whatever is to be his business or profession. The smaller colleges and most of the so-called "universities" should devote themselves to the more modest but more useful work of becom-

* Since writing the above I have received the Report of Michigan University to the Board of Regents, from which I quote the following: "In the Michigan system, for the present at least, the secondary education must be completed, not in the high school, but in the university; and end with the 'required studies,' or about two years after matriculation. The age at which the youth of Michigan pass from the secondary to the higher work in the university is a little upward of twenty. Thus they are about two years older than the German student at the same stage of education. There is, therefore, no reason to fear that in giving our students at this point perfect university privileges, that is,—perfect freedom in choice of studies and amount of work,—we incur any risk of lowering the standard of higher education; unless, indeed, our American youth are supposed to have much less capacity for attainment, and so much less maturity of judgment, that they cannot be trusted at twenty or twenty-one with the freedom accorded to the German student at eighteen or nineteen."—*Prof. Frieze's Report.*

ing high schools. In the colleges proper there would then be, at the end of the second year, a line drawn between college work and university work, between college methods and university methods; on one side of which preparatory work and elementary methods, carried out with vigor and thoroughness, should prevail, to be superceded by scientific methods, by personal research in special lines of study, by personal communion with sources. The lack of opportunities to pursue special courses in the classics, in history, in politics, in political economy, in physics, in mathematics,—a want deeply felt among a large and constantly increasing class of students,—is yearly sending thousands to foreign universities. Where in the United States can a teacher prepare himself thoroughly to give instruction in Latin, or in history, or in political economy? The ordinary college-training is far from sufficient, The Germans require their teachers of the classics to pursue Latin and Greek as a specialty for four years after completing the course in the gymnasium, which as a classical school ranks with our best colleges.

It may be answered that many colleges are now doing, during the last two years, or during the post-graduate course, substantially this special work. Do not college students, in these elective courses, read harder Greek and Latin, and work more difficult problems in mathematics and physics? They do, indeed, but mainly according to college methods. The aim is not to lead the student to carry out a line of investigation by himself; he is not taught or encouraged to repeat the work of the original investigator. It is too much a continuance of the old system, — hearing of recitations, the mastery of the text-book. A question in physics practically elucidated, geology studied with the hammer in hand, a text critically examined, would be a powerful incentive to personal research, and would be worth more to the student at the age of twenty, — the age at which this course of study ought to be completed, — than any amount of instruction. It would, in fact, infuse a new life into college work, and give in a measure that practical and useful training which is the one increasing demand of the age. What student of history does not know how a thorough knowledge of one period, gained by original research, helps to the mastery of another? The student who has worked in this way gains a certain historical tact which enables him to deal almost as a master, even with those periods on which he has not brought original research to bear. What a travesty on all true learning is the study of history as now pursued in our colleges, consisting as it does of a few recitations from a text-book and of a few lectures that really have little matter in them to spur the student to original investigation.

It can with truth be urged that many colleges have opened to students, without success, just these very courses suited to modern ideas of education. As early as 1826 Amherst College provided, "in addition to its present classical and scientific four-years' course,* a new course equally thorough and elevated, but distinguished from it by a more modern and national aspect, and by a better adaptation to the taste and future pusuits of a large class of young men, who aspire to the advantages of a liberal education." The modern languages were substituted for Latin and Greek, and greater attention was to be given to practical mechanics, chemistry, and modern history. About the same time Yale adopted a similar course, while Harvard, in order to meet the supposed wants of special students, opened the doors of the University "to persons who are not candidates for a degree, but desire to study in particular departments only." "It was expected that a large body of students would be attracted to Cambridge by these concessions, but during sixteen years only eighteen students availed themselves of these advantages." After the failure of their experiment, the elective system was introduced with equally confident expectations, but many colleges soon fell back to "their old and approved ways of a fixed, uniform, and classical curriculum." About 1850 a revolution was effected in the constitution of Brown University, radical enough, it would seem, to satisfy the demands of modern education. "The fixed term of four years, or any other term," says the report, "is abandoned, and every student is allowed to pursue as many or as few courses of study as he may choose, subject to certain limitations. Persons are to be admitted to studies of several courses, if prepared to pursue these only." There was no general examination for admission. Great results were expected, and the speedy downfall of the old scholastic system was confidently predicted. The expectations were not realized, and the words that Dr. Wayland has written in regard to the changes at Amherst and Harvard were destined to be realized: "The colleges, so far as I know, which have obeyed the suggestions of the public, have failed to find themselves sustained by the public. The means which it was supposed would increase the number of students has, in fact, diminished it; and thus things gradually, after a variety of trials, have generally tended to their original constitution. So much easier is it to point out evils than to remove them. And thus have we been taught that the public does not always know what it wants, and that it is not always wise to take it at its word."

Is it not, in view of the facts, a little remarkable that the Institute

* See "Porter's American Colleges and the American Public," p. 11 ff.

of Technology, the Rensselear Polytechnic Institute, and the Columbia School of Mines have opened to students special courses analogous to those that have proven failures in the colleges, with a success so marked and gratifying that the colleges have again been compelled to reintroduce courses similar to those once abandoned, and to allow the largest liberty to electives? Harvard college, after once abandoning the elective system, has a second time adopted it on the most liberal scale, and now advertises "that its studies are largely elective." Does it not seem absurd for a college, in obedience to the practical spirit of the age, to establish special courses of study in the modern languages, and then adopt methods of teaching by which the student can never acquire facility in reading and speaking those languages nor any large acquaintance with the literature, thus defeating the very aim in view? Then, again, would it not be still more repulsive if methods that have already proved failures in teaching the classics should be applied to the modern languages, and the "grindstone" theory be set up, that these studies, too, are chiefly useful as mental gymnastics? Practical courses of study can be of but little utility unless followed by practical methods of instruction, — in the languages, by conversation, by writing, by reading so much that "ponies" will be drowned out by the very quantity of the text; in the sciences, after the leading principles and truths are comprehended, by scientific and technical instruction, by laboratory work, by personal research, by repeating the process of the original investigation; — such methods could not fail to give the students vital, quickening, practical knowledge. The statement recently made, that the students of political economy in one of our universities were at work on the report of the Secretary of the Treasury of the United States, produced quite a sensation. And yet this kind of work, after the preparatory studies are completed is indispensable if the student is ever to gain that keen perception, that firmer grasp, that more exact knowledge which will always evade him in his school-boy tasks of hearing recitations; for the mind is roused and stimulated by questions, not by answers. The essential thing in education is to offer problems to the student without a solution, — problems that will demand some genuine exertion of his own faculties, an exertion that will improve his mind and make his work delightful.

We have all the materials from which to organize a system of instruction that would in time equal that of any other country, but as matters are now managed the waste of time is ruinous and must eventually break down our college system. The need, at present, is organization and better methods of instruction. It is not necessary

to separate the university from the college, but each one of our best colleges might, after the preparatory work is done, make all studies elective, as Michigan University has done, enlarge the course, — and by that I do not mean merely to increase the number of studies, — giving opportunities to pursue special lines of study in the classics, in history, in politics, in political economy, in physics, etc. The result would be that, instead of an indiscriminate selection of electives as at present, which really leads to nothing, the student would give his whole time to those special studies that would prepare him for some particular profession, as that of journalist or of chemist, or of physicist, or of teacher of Latin and Greek ; but a diploma in the classics would not enable one to secure a position to teach mathematics. Such an arrangement as I have described would save several years, — unless the student, as too many do at present, enter upon his professional studies without the preparatory training, — and enable the student to complete his business or professional studies at the age of twenty, as he certainly ought to do. Besides, such special training would show that a college education is not only desirable but indispensable to one who hopes to compete successfully in these professions just enumerated. It may seem to some that the course I have described would open the door to greater confusion, and more bewildering complications than at present prevails in the over-crowded curriculum of most colleges, and encourage the student in a still wider range of electives ; but there would be all the time an effectual check on the student in the increase of the standard for a degree in these special courses.

The special work in classics, in history, in politics, etc., that I have in view might be very much facilitated by the establishment of seminaries similar to those connected with the German universities, in which the professor personally encourages and directs a limited number of students in special lines of investigation. It is really in these seminaries that the student catches the liberal spirit of the place, and feels the incentive to untried exertions, which the contact with superior minds always awakens. Our college and university work might also be very much facilitated by the organization of societies such as are found at every German university, to afford opportunities to acquire facility in speaking Latin, the modern languages, and for a critical study of their formation and structure, as well as for special work in history, political science, etc.

These methods of instruction, this work in special lines of study, these changes in college and university organization, if once set in operation, would react upon our whole school system. We should

then no longer find instructors teaching the languages who have prepared themselves to teach astronomy, or, as it now sometimes happens, who have never prepared themselves to teach anything. The effect of these changes would be so beneficial that our whole school system would eventually be lifted to that point where our present standard of admission to college, — which is so high, or, as Stewart Mills puts it, "the preliminary work is so poor," that the average age of candidates has reached a limit which all experience shows ought not to be exceeded; ought not, in fact, to be retained, — would not, after all, be such a superhuman thing.

I do not wish to be understood as casting blame on professors and presidents of our colleges for not doing more. With their present amount of work it is impossible to reach the standard I have in view. A German professor has a specialty with seven hours' work during the week, while an American professor is not only overloaded with work, but that too in several lines of study. Still, with the present facilities, something could be done. It is a pity that no New-England college should open the way for special lines of study to be pursued systematically under first-rate instruction, and, at the same time, bring the college into more intimate connection with the whole school system by establishing a department of Pedagogy. To learn what a wise system* of organization can accomplish, we have but to look to Michigan University,—which is fast moving towards its ideal, the first university in America, — in which the whole educational system ends, supplemented by a course in pedagogy.

No one who has considered the matter can doubt that the thorough qualifications so needful and desirable in a teacher can be produced, cultivated, and refined only by a careful, theoretical, and practical training, — such a training as, with proper organization, is within the power of our best colleges to give. "The art of teaching," says Mr. Stanton in his report on the School Inquiry Commission, "no more comes by instinct than the art of healing; and it is a grievous mistake for any one to suppose, because he himself is educated, that therefore he is qualified to teach others." There is, at present, no more pressing need, — one that is endangering our whole system of education, — than to have these truths recognized by insisting that every teacher should be properly and thoroughly trained in the theory and practice of his profession. No profession ought to stand more

*The necessity for three grades, — the grammar school, the high school, and the college, — in our system of education has generally been recognized by the best educators. This is substantially the position that Dr. Barnard takes. The university, when organized, will form the fourth grade, and really supplement the whole system.

upon its merits than that of teaching, and to make its standard so high as not to be partly usurped by any other profession, or to be invaded by tyros and pretenders. Division of labor, necessary in every department of life, is indispensable here, if thorough efficiency is to be the result. It is true that the line is now pretty sharply drawn between the real educational artist and the tyro, but education is not yet a distinct profession. Colleges could wonderfully help on the work of scientific education by a course in pedagogy, and at the same time place themselves in sympathy with the whole system of education, which would return to them a harvest of untold riches.

The Government could interfere here with advantage. No lawyer, no doctor, no teacher of a high school, no professor, ought to be allowed to undertake the duties of his office without having completed, at least, a limited university course and passed its examination. Again, none but real colleges and universities should be allowed to call themselves such. "The Government has precisely the same right to forbid an ordinary college, — one that in thoroughness and completeness of its course of study falls far below a German gymnasium, — from calling itself a university, that it has to prevent one from traveling over the country as Secretary Evarts, and thus securing the various advantages which might accrue to him from representing himself as the honorable Secretary of the United States." *

The reorganization of such a vast system may seem to many people chimerical, but the plan I have sketched would work gradually from the top downward. Better and more practical methods of instruction, combined with earlier specialization, would give an impetus to the whole system that before many years would be felt in the remotest village school. The more one studies the educational problem, the more one investigates the ways and means of educational success and progress, the more certain is he to come back to the elementary conclusion embodied in the trite maxim, "As is the teacher so is the school." There is no conceivable substitute for incompetency in the teacher; hence the essential test of a school system is to be looked for in the quality of its teachers. Is it business-like that, in our present system of education, there is no opportunity throughout the length and breadth of New England for teachers in the higher departments to prepare themselves adequately for their work? There will never be a full degree of satisfaction with the results accruing from our system of education, there will never

* See a valuable article, by Richard T. Ely, on American Colleges and German Universities.

be genuine support and confidence from the public, until the same business-like methods, the same energy, and modern ideas, are introduced into our methods of instruction and organization that pervade the world's work in other departments.

I have but little time left to ask your attention, in conclusion, to one other defect which pervades our whole school system, and which if remedied would go far in helping on that practical, political, or national education which the spirit of the age so imperatively demands; viz., the almost total neglect of the study of history. Here, again, our colleges are directly responsible; for in none of them is there any instruction in history worthy of the important position that this subject ought to occupy.

Polybius begins his great work by advising all mankind to apply themselves with earnestness to the study of history, since the knowledge of past events affords the best instruction for the regulation and good conduct of human life, and particularly *because history supplies the only proper discipline to train and exercise the mind of those who are inclined to enter into public affairs.* In a country like ours, where every citizen is interested in political affairs, one of the primary aims of education, it would seem, ought to be to equip the future citizen, to prepare him at least to follow, with some degree of intelligence, the march of contemporary events; to teach him, as Persius says, "his position in the great republic of man." Now the classics, if properly studied, give a certain gift of speech, grace of thought, and insight into modern thought and speculation, because these have their root in ancient thought and speculation; the physical sciences train the powers of observation; mathematics and philosophy have in the general scheme of education a useful and proper office to perform; but with the help derived from all of these, who has not wished, in the midst of the momentous social and political changes that are going on around him, — changes in which the most humble must take a part, whether he knows it or not, — who has not wished that his powers of observation had been trained and the keenness of his perceptive faculties sharpened by a thorough study of the political and social questions that have agitated other times? To-day theories are being proposed which have long since been extinguished in blood, — and legislation is being enacted which the slightest knowledge of the past experience of mankind would show must end in failure. There are in this country great social and financial questions pressing to the front; problems are arising as fearful as those that have deluged nations in blood, — the right of minorities, the necessity for industrial education, and the relation of capital to labor, which, as the low

mntterings of poverty increase, will assume tremendous proportions. The question is, Shall problems of such fearful moment to the weal or woe of this land be decided by men trained to a knowledge of past failures and experiences, which affords the best guarantee of future success, or shall we pay the penalty that progress has cost in other lands? Fortunately there are studies that throw a light on these great social and political problems, — studies that give us the thread in the labyrinth of human affairs, — studies that afford valuable suggestions and help for the regulation and guidance of human life. The oracle pronounced Socrates the wisest of men because he made man the object of his study. The sciences deal with matter, history deals with man. History teaches more of man: it gives us a glimpse of the path along which the race has traveled to its present position; it is a chart for him who reads to guide him in his journey through life. To one thoroughly versed in the past experiences of the human race, the social and political changes of the present no longer seem capricious, for he can refer them to certain laws almost as definite and certain as that of gravitation. Hence the tendency of historical studies is to eliminate from life wild and visionary schemes, and give a stability and fixedness of purpose.

History, then, ought to occupy a high place in the work of education. Let me not, however, leave the impression that we have but to study the past to judge the present, — to read of the revolutions in past ages to explain ours. History *is* the instructress of the present, but not in the narrow sense that we have but to turn over the records of past centuries and collect from these the materials for a political diagnosis and the specifics for a prescription. "History is instruction," says Mommsen, "only so far as the study of earlier forms of culture reveal the condition of society, — the fundamental forces always alike, the manner of their combination everywhere different, — and encourages independent reproduction not unreflecting imitation." . . . . . .

The interest of history, then, centers mainly in the inner life of a community, in the study of those intellectual and moral forces of which all else is but the expression. Here, however, many phenomena, — political, economical, educational, social, commercial, — present themselves for study, and all deserve careful and considerate attention. It is not possible for one to be proficient in all these departments, and hence the province of history for the large mass of students certainly, after they have once traversed its outline, must be still further narrowed. Does not the principle of utility, nay of necessity, enter here and determine the direction our investigations

ought to take? The fact that every citizen in this country has a share in determining the policy of the government, demands that some preparation shall be the indispensable requisite for citizenship. The study of that part of history which treats of political institutions or of politics, using the word in the broad and comprehensive sense given to it by Aristotle, would furnish precisely the preparation needed to fit every one to take, as he ought, an active interest in politics. "We alone regard the man," said Pericles, "who takes no interest in politics not as a quiet and harmless citizen, but as a useless one." Bnt how can one take an intelligent interest in measures determining the future policy of the government, if he has no knowledge of past measures and policies? How much the study of political history or politics would help in this work of intelligent citizenship, — in revealing the false theories that are preying upon society, and in warning us to shut our doors against a multitude of "isms." And yet how little our colleges and schools do to promote the study of this important branch of learning, which is so indispensable to good citizenship. Hardly half a dozen of our colleges have a chair of history, and not one teaches United States history thoroughly. The result is that this important branch of education is completed by memorizing a few names and dates before admission to college, and then by forty or fifty recitations and a few lectures on ancient and modern history, which too often are merely "superficial expositions of results by a speaker who himself understands them imperfectly, to the intent that his hearers may be able to talk about them without understanding them at all." If one wishes to study even the history of the United States as a specialty he must go abroad, for as yet no one has made so thorough and exhaustive a study of our political history as Von Holst has done.

There was a time when this college formed a marked and praiseworthy exception to this general neglect of historical studies. History, at one time, held here the first rank. There was certainly no feature of our college training, much as we prize it all, to which the older graduates look back with a more lively sense of appreciation and gratitude than to the interesting course of historical studies, which seemed at that time extensive and comprehensive in comparison with the meagre and unsatisfactory opportunities in this department offered by other colleges. I have never yet heard any satisfactory reason for the discontinuance of this historical course. It was a study the delight of which we have always carried with us. *Pernoctat nobiscum, peregrinatur, rusticatur.*

If the student of the natural sciences is reminded, as he walks in

the fields and along the road, of his favorite study, and of that beloved teacher,* — *serus in cœlum redeas*, — who guided him in these researches, neither can the student of history efface from his memory the precepts of that revered and honored man,† — *requiescat in pace*, — who, like Socrates, knowing nothing himself, yet guided others to knowledge by his gentle suggestions and searching interrogations.

The proper study of history lights up the political world of the present and past, disclosing a rich store of human experience and conduct which we may use for our own guidance if we will but avail ourselves of these treasures. Who can doubt that if our colleges and schools have taught theories, during the past twenty years, the principles of good government and correct, of finance with the same zeal and energy as they have the technical principles of English and Latin grammar, that a much smaller number would have been carried away by the false theories and pernicious heresies that have swept like wild-fire over our country in recent years. Now the study of history, that part of it relating to political institutions, — or the practical study of politics, as Aristotle calls it, — would furnish precisely the training necessary to grapple with such financial and social heresies. Particularly a critical and thorough study of the history of our own country, which could not fail to have an enlarging, ennobling, stimulating, inspiring influence, — for we have a history quite as suggestive as that of ancient Greece and Rome, — would furnish that national education, that preparation for intelligent citizenship so imperatively demanded by the age. This knowledge of politics and party measures, so essential to the well-being of any free government, would make still stronger those forces that, working through the public schools, have already been so potent in eliminating differences of birth, creed, and sectional feeling, and of imparting that homogeneity of purpose and love of law and good government which will make these States "one and inseparable, now and forever."

* John P. Marshall, formerly professor of Chemistry and the Physical Sciences, now professor of Geology and Mineralogy.

† Hosea Ballou, 2d, the first president of Tufts College, and professor of History.

JOHN HOWARD RAYMOND.

JOHN HOWARD RAYMOND, late president of Vassar College, whose portrait is the frontispiece of this number of EDUCATION, was born March 7, 1814, in the city of New York. From an autobiographical sketch of his early life, found incorporated in the admirable memoir of his life, edited by his eldest daughter, we gather some interesting facts of his boyhood, school and college life. He was sent to school when three years of age, and from that time had never been out of school except on regular vacations; passing without intermission from pupil to teacher, tutor, professor, and president of a college. In his library was found a time-worn copy of Goold Brown's grammar, which bears this inscription: "This book I studied thoroughly and (considering my age) understandingly, under the instruction of the author, in the winter of 1823–24 when I was between nine and ten years old; it was the foundation of all the intellectual discipline I ever had." This explains the enthusiasm with which he always expatiated upon the importance of a thorough study of language. He was a firm believer in the importance of Latin as a fundamental study in a course of instruction. Of his boyish life he writes, that it presents itself to the eye of recollection under a two-fold aspect: the first, a winter life, pent up in city walls, and under the eye of severe domestic and scholastic discipline, the life of . . . . "whining school-boy with his satchel, and shining morning face, creeping like a snail unwillingly to school;" the other, a joyous, free, and happy summer life, amid green fields and under genial skies. The homestead of his paternal ancesters was in the town of Norfolk, Ct., where he spent the golden summer months in country sports. He was exceedingly averse to many out-door sports, but says he, "could swim like a duck," "could not jump the length of my leg, nor run as fast as a smart kitten;" "never raised a kite in my life;" "wrestling was my abhorrence," "and as to actual fighting, my discretion was always of more service to me than my valor." He was much more interested in those games and amusements which required invention and manual skill rather than agility or strength. Of his first teacher he did not have any pleasant memories. He says "the feature in her education which was most *striking* at the time, and has left the deepest impression, was the frequent and smart application of her thimble-shod middle finger to the susceptible crania of her pupils, to the manifest multiplication of their cerebral organs." His next teacher, who was a cripple, "performed the same philosophical operation with his crutch, used hammerwise." At eight years of age he was transferred to the classical school of Goold Brown, the well-known author of grammars, — who was a Quaker, and a "jewel of a pedagogue." He says he "left this school with my head full of Brown's Institutes, and my doom sealed beyond redemption. I was a predestinate 'professor of English grammar.'"

He spent a year at Hamilton Academy, where he began the study of Latin. During this year of his life he lost his much-loved mother, which deeply affected him. Later he became a student at the New York high-school, where he remained until the fall of 1828 when he entered the freshman class of Columbia College, in the city of New York, which was noted for the excellence of its classical course. His life in Columbia was in many respects unpleasant, and before graduating he sought admission to Union College, at Schenectady, N. Y., and was admitted to the second term of the senior year. His room-mate was seized with small-pox, and he left for home, having obtained leave of absence and permission to commence and pursue the study of law during the balance of his course. Owing to the appearance of cholera there was no commencement at Union that year, but during the ensuing autumn his diploma was sent to him. He says, "The sheep-skin trophy of my victory was lost within twenty-four hours after its reception." "I remember taking it home and throwing it on a table in the hall, and that was the last of it." He further adds: "This is not the age or the country in which a piece of parchment, disfigured with bad Latin, bad engraving, and bad penmanship, can add dignity to one's character or weight to one's influence, or in which the want of it will exclude one from any field of honorable labor to which his personal qualifications adapt him. With us the *fact* is everything, the *symbol* nothing or next to nothing. And so far, at least, as my own observation extends, men get along now-a-days by exhibiting, not *testimonials*, but *abilities*."

At the age of eighteen, in the spring of 1832, he commenced reading law in the office of one of the most eminent business lawyers in New York (Seth P. Staples, Esq.) Here he remained until the fall of 1833, at the same time giving instruction to a limited number of private pupils in Brooklyn. During the following winter he went to New Haven to attend the Yale Law School, where he became deeply impressed by the great truths of religion, and after a searching investigation, recorded his fixed resolution "to embrace and act upon the truth." His consecration was complete, as shown by his subsequent life and character.

In the fall of 1835, after his conversion, he went to Hamilton, Madison Co., N. Y., first to study and then to teach in the Baptist Theological Seminary, where he spent fifteen years of his life. He became deeply interested in missionary work, and his letters show how earnest and enthusiastic he was to do good. After fifteen years at Hamilton, and a professorship of five years at Rochester University, he returned to his early Brooklyn home as president of the Polytechnic Institute. It was in July, 1855, that the degree of LL.D. was conferred upon Prof. Raymond by the University of Rochester, and his official connection with the institution ceased at that time. His work at Hamilton and Rochester was the period of his adult life, unmarked by sorrow or excessive care. In accepting the presidency of the Polytechnic Institute, he was compelled to bring into active exercise all of his reserved energies in outlining and developing the

organization. In writing of the early days of the Polytechnic he says: "Never have I so felt the want of a power of ubiquity or self-multiplication." The plans he made for this institution were broad; but a large proportion of those who entered the Institute desired an education that should fit them for mercantile and commercial rather than professional life, and Dr. Raymond was unable to carry his plans to that completeness which he desired. One feature of his management should have a passing notice. He rejected from the first all corporal punishment from its discipline. For twenty-five years the Brooklyn Polytechnic, with more than seven hundred pupils, has been under an exclusive moral control, and the sound of ignominious blows has never been heard within her walls.

Dr. Raymond's health began to decline under the arduous labors of his work, and in the spring of 1863 he accepted the invitation of his friend Henry Ward Beecher to accompany him on a trip to Europe, and the letters written during those three months of absence abound in references to the companionship which enhanced the delights of the trip. His letters to his wife and children reveal to us a husband and father of model excellence. From the day of his marriage at Angelica, N. Y., to the day of his death he was a faithful and devoted example of a Christian, in all his domestic relations. The bond that knit his heart to his children was made tender by many bereavements. His deepest happiness came through the affections of home, and through them came also his deepest sorrows. His daughter, in her memoir, says, "His very being seemed interwoven with every form of beauty, until all nature has come to seem a part of the beloved father's nature, that made life such a constant lesson of loveliness to his children." His discriminating love of art and the delicacy of his æsthetic taste was shown in the fondness he had for music, the uplifting and refining power of which he enjoyed with his family.

Our limited space only permits us to refer to Dr. Raymond's labors, in connection with Vassar College. Early in 1861 Mr. Vassar, the founder of the institution, appointed him a member of the first board of trustees, and his life blends, from that time, with the organization and development of Vassar College. He entered fully into the plans proposed by the founder, of establishing an institution which should be "to young women," what Yale and Harvard colleges were to young men, — furnishing them the opportunity of a *truly liberal education*. At this period there was not in all Christendom a single *endowed college* for young women. From the date of the first meeting of the board of trustees, Dr. Raymond showed a growing interest and sympathy in the enterprise, which was soon quickened into an earnest enthusiasm. He took an active part in the deliberations of the trustees, and in the spring of 1864 his name was mentioned by Prof. Jewett as the man best able to harmonize and adjust, to organize and animate this great undertaking. He had just offered his resignation at the "Polytechnic," hoping to secure complete rest from official labors, which the trustees of that institution declined to accept. The friends of Vassar were persist-

ent, thinking his experience in the course of education, of thirty years (fourteen in the faculty of Hamilton, five at Rochester, and nine at the Brooklyn Polytechnic), fitted him eminently for the first presidency of the new college. After much deliberation and consultation with Mr. Vassar and others he finally sent the trustees, on June 10, 1864, his letter of acceptance of the position. He at once entered upon the delicate and difficult work of organization; and in sympathy with Mr. Vassar's views, the college was established on a broad catholic basis, not dependent for its support on any single religious denomination, but "to aid in the foundation of symmetrical, graceful, noble womanhood." On the 20th of September, 1865, the college opened with nearly three hundred students, many of whom were not fully prepared to enter upon a strictly college course. The work of classification of pupils and the regulations of departments and teachers was an enormous labor. Dr. Raymond persevered, and at the close of the third year the *provisional course of study* had finished its work and the regular college curriculum, upon which he had spent much laborious thought, was entered upon.

His faith in the capability of women to master the most difficult branches of study was tested, and forcibly illustrated, during the few first years of the college, — in astronomy under Dr. Mitchell, and in the classical languages, at that time under Prof. Robert. One of the students writes that "The enthusiasm felt by our class over the study of Greek was owing almost entirely to Dr. Raymond's influence." He always opposed the admission of non-collegiate students. This was his great point, and he strenuously insisted upon the college maintaining its strictly collegiate character. At the close of the first decade of the college, in 1875, Dr. Raymond found himself in greatly impaired health, and sought restoration once more in European travel, and was again greatly benefitted for a time; but the three subsequent years of constant care and labor sufficed to exhaust his strength. The commencement of 1878 was destined to be the last days of his public ministration. He entered with joyous zest into all the duties, social and official, of the work and, said he, "never have I been so thoroughly *satisfied* with a commencement."

Four days after the public exercises, he was taken ill, and sought relief at Saratoga, hoping the waters might restore him, but each day disappointed the hope, and he was brought back to the college at Poughkeepsie where he lingered among the friends he loved so tenderly, a few days, and then passed peacefully away. The last sentence he tried to utter was eminently characteristic of the man. It was broken and difficult to catch, but distinct in meaning. "How easy, — how easy, — how easy, — to glide from the work here to the work — " *there* he evidently wished to say, but utterance failed him. One of his gifted graduates at the Polytechnic Institute has truthfully estimated the life-record of this noble worker in education:

"Power without ambition, consecration without bigotry, enthusiasm with-

out fanaticism, gentleness without timidity, perseverance without combativeness, dignity without pomp, mirth without frivolity, versatility without dissipation of energy, candor without uncertainty, and piety without cant."

He lived for others, and chose a work modest in character, but most important and useful; and his memory will grow through the generations, as the friend and wise guide of the young of his day.

FOREIGN.

GREAT BRITAIN.—ENGLAND.—In the recent report of the Council of the Senate of Cambridge University relative to the proposed Professorship of Animal Morphology, it is stated that the classes in biology are now so large that the accommodations provided a few years ago have become insufficient. This year there have been about 55 students in elementary morphology, and 20 in the advanced class; 70 students attend elementary physiology, and about 15 the advanced course. The recommendation that a Professorship of Animal Morphology should be established was carried by a grace of the Senate passed May 11, and on the 31st of the same month Mr. Francis Maitland Balfour, M.A., F.R.S., Fellow of Trinity College, was by a unanimous vote of the members of the electoral roll selected to fill the newly-established chair. Mr. Balfour's investigations in embryology and comparative anatomy have already placed him in the front rank of original workers in these branches of science, a distinction seldom attained at the early age of thirty-two years. It is well known that the teaching of animal morphology has been created in Cambridge by the efforts of Mr. Balfour, and that it has grown to its present importance through his ability as a teacher and his scientific reputation. It is provided that the new professorship shall terminate with the tenure of office of the professor first elected, unless the University shall decide upon its continuance. The stipend attached to the chair is £300 per annum.

The annual report of the Museums and Lecture Rooms' Syndicate at Cambridge gives a valuable record of work. In the department of experimental physics it appears that 62 students were attending the practical classes in the Lent term, doing work which few of the candidates for the mathematical or natural sciences triposes ever did at Cambridge before the establishment of the Cavendish Laboratory. The pupils in mechanism in Prof. Stuart's workshop numbered 36 during the past winter. In chemistry the increase in the students has considerably exceeded the accommodation available in the University laboratory, notwithstanding the existence of several college laboratories. Professors Liveing and Derrar plead strongly for further provision as regards both buildings and appliances, such as may bear comparison with those of Zurich and Bonn; they believe that to delay building until other departments can be adequately

dealt with will be most detrimental to the present flourishing prospects of chemistry.

Oxford.—"The establishment of the Wayneflete Professorship of Physiology was provided for by the late University Commission, it being arranged that the emoluments of the post should be paid out of the funds of Magdalen College, to which college the professor is to be attached as a Fellow." "It is understood that Magdalen College, acting on the representations of the University to that effect, has determined to apply such surplus funds as are available at once to the foundation of the professorship, and it is expected that an election to the post will therefore take place shortly." The professor is required by the statutes to give instruction in Human and Comparative Physiology with Histology.

Technical Instruction.—The importance which the English government attaches to the subject of technical instruction was evidenced by the appointment of a Royal Commission in August, 1881, to investigate and report upon the methods and results of such instruction in other countries. The Commission has published a preliminary report embodying their observations in France upon the education of workmen as distinguished from foremen and proprietors. The commissioners regard with favor the addition of a workshop to elementary schools and advise that the experiment be tried in England. Though impressed by the operation of the French apprenticeship-schools, they are of the opinion that it would not be wise to attempt their introduction into England until they have been further tested in France. In art-teaching they declare that France is greatly in advance of Great Britain, and that the proportion of real working-men receiving practical art-instruction in France is greater beyond comparison than it is in the United Kingdom.

The acceptance by the Prince of Wales of the presidency of City and Guilds of London Institute for the advancement of technical education, is regarded as an auspicious event. Since the issue of the first annual report in 1881, the funds of the Institute have been augmented by contributions from eight additional companies, the grocers, skinners, vinters, etc.

The foundation-stone of Finsbury College was laid May 10, 1881, by Prince Leopold, and the foundation-stone of the Central Institute in July, by the Prince of Wales. Finsbury College will eventually accommodate the schools of Technical Chemistry, of Technical Physics, and of Applied Mechanics. Meantime, instruction is given in the temporary class-rooms of the Institute in the Cowper-street schools. It is expected that the Central Institution will be opened for work in 1884.

City and Guilds School of Technical Art.—During the past year the additional studios, for the erection of which a special grant of £750 was allowed, have been completed. The new studios afford room for the increased number of students who eagerly avail themselves of the system of art-teaching as applied to industrial work, which is pursued in this school. The number of students receiving instruction in the Art School is 119, of whom 52 are women.

Dr. Graham, professor of Chemical Technology at University College, reports that his instruction has embraced brewing, bread-making, heating and lighting, and metallurgy. Eight students, nominated by the Institute, were admitted to Professor Graham's lectures without payment of fees. Of these, four distinguished themselves at the technological examinations, and are now employed as chemists in large industrial works, and one is engaged in technical teaching.

The City and Guilds of London Institute afford facilities for carrying out an examination in any of the subjects enumerated in their program, wherever a class for instruction is formed, or a sufficient number of candidates present themselves, provided an approved local committee undertakes to carry out the examination according to the rules specified. The program for 1881–82 includes thirty-two subjects, arranged so as to group together under "allied industries." The examinations are in two grades, ordinary or "pass" and honors.

Grants to Teachers.—"With the view of encouraging the formation of classes for the study of technological subjects in towns where no college or school for technical education exists, in which evening instruction in these subjects adapted to artizans and others is already provided, the Institute is prepared to make payments, subject to the conditions laid down in the program, to duly registered teachers on the results of the examination of their pupils."

From this brief outline it will be seen that the Institute is prepared to exercise a determining influence in the development of technical education, and to make itself felt throughout the kingdom.

SCOTLAND.—Two measures affecting education in Scotland, recently introduced into Parliament, are watched with deep interest; namely, the Endowment Bill, and the Bill to regulate the procedure of School Boards, in the dismissal of teachers. The first has in view the wants of secondary education. A well-known feature of the Scottish system of education is the union of all its parts. Not secondary schools alone, but elementary, prepare boys for the universities, and it is the evident determination of the people to keep a highway to the superior institutions open to the humblest scholars. Nevertheless it is recognized that the means for secondary instruction are entirely inadequate. The Scottish Education Department proposes a graded system of schools with provision for higher instruction in one school in each district. It has also been suggested that secondary schools be established in central localities for the accommodation of the districts of several school-boards. However these propositions may be decided, it is plain that the funds for secondary education must be increased. It is stated that several single foundations in England, as Eton and Winchester, possess larger revenues than almost all the burgh schools and universities in Scotland, taken together. While poor in strictly education endowments, Scotland possesses great revenues in certain foundations that

are classed as educational. Very little benefit is derived from these, and they have been the subject of several attempted reforms. Mr. Mundella's bill proposes the appointment of seven commissioners empowered to draft schemes for the reorganization of these endowments. The schemes will become subjects of legislation. The commissioners are directed to have special regard to making provision for secondary or higher education in Scotland, whether in the industrial arts, or as a preparation for commercial pursuits, or for the universities. They are also directed to extend to girls the benefit of endowments so far as can be conveniently done.

The Bill to regulate tenure of office is intended to protect teachers from the arbitrary and capricious action of school boards, which has become intolerable. It is not thought that the Bill does full justice to teachers, but as an admission of the existing evil and a concession to the teachers' demands it is commended. On these grounds the Edinburgh and other School Boards have agreed to petition in its favor.

FRANCE.—*The Education Act.*—The new French Education Act is pronounced by English journals the most sweeping educational measure ever passed in any country. The "Times" calls attention to the fact that the entire population of France falls under its jurisdiction, and adds: "An attempt, such as is about to be made (without doubt successfully) in France, to compel little children taught by private tutors, or by their fathers and mothers, to render an account of their literary proficiency, with a penalty on the dunces of being dispatched to school, would, if extended to England, provoke something like a rebellion." The interest with which the Act is regarded abroad is only less than the excitement it occasions in France. By opponents of the Republicans it is styled the "Atheistic Education Act." It has created division in the ranks of the Bonapartists, only thirteen of the forty Bonapartist Deputies having signed the protest against its secular features, drawn up by Bishop Freppel and his fellow-Legitimists. The Legitimists are themselves divided as to how they are to deal with the Act. Mayors being ex-officio chairmen of the School Boards, their refusal to act would involve their resignation or dismission. The Bishops are, one after the other, advising conditional submission to the Act. Cardinal Guibert, Archbishop of Paris, in a circular to monks and nuns engaged in primary schools, advises them to make the best of the Act. He thinks that if the provisions of the Act debarred teachers from all participation in religious teaching they could not retain their posts. He construes the law, however, as simply making religious instruction no longer compulsory, and argues that it does not prohibit prayer on opening school, or the placing of religious symbols on the walls. It is difficult to see exactly how the services of teachers belonging to religious orders are to be dispensed with. Of the 110,709 teachers now employed in the elementary schools, 46,684 (9,468 males and 37,216 females) belong to the interdicted orders.

From the report of the Minister of Public Instruction upon primary edu-

cation in 1880–81, it appears that the total number of schools at the end of the school year (1880–81) was 74,441, an increase of 677 (viz., 651 public and 26 private) over the number reported in 1879–80. The lay schools had increased by 1,190, and the religious schools decreased by 539. The number of teachers had increased by 2,890; viz., 1,228 males and 1,662 females. The total number of pupils in primary schools was 5,049,363 in 1880–81, as against 4,949,591 in 1879–80. There were still 231,989 children between six and thirteen years of age who attended no school. The number of *Salles d'asile* was 4,870, an increase of 215; the number of teachers in the same, 7,451; of pupils, 621,177. The number of school-libraries in 1880–81 was 25,913, an increase of 2,191 over the previous year.

Of the eighty-seven departments of France, all but six have established training-schools for masters. There are also two higher training-colleges in which the teachers for these normal schools are prepared. The estimate of the Ministry of Public Instruction for the year 1882 is, in round numbers, $17,150,000, including $3,170,000 contributed by the 87 departments; but it is expected that the former sum will have to be increased by from $4,000,000 to $5,000,000 for primary instruction, as the result of the law on gratuitous instruction of June 16, 1881. The estimate for fine arts, which are now under a separate administration, includes a sum of $70,000 for subventions to municipal schools for instruction in drawing. The estimate of the Ministry of Agriculture and Commerce includes $200,000 for veterinary schools, $404,000 for agricultural instruction, $373,000 for technical schools, and $43,000 for schools of forestry. Besides these sums there are very large amounts, recurring annually, disbursed by the State and the departments, and charged in various ways, for the erection and repairs of school-buildings for superior and secondary instruction, in addition to the sums noticed above. There are also sums charged in the budgets of other ministries for educational purposes, which cannot be readily separated from other branches of the service.

A statement of the estimates for education in certain representative municipalities gives for Paris a total of $3,956,500, not including the office expenses of the central administration nor the interest on money borrowed. After the budget was presented, $400,000 additional were voted for the erection of apprenticeship schools.

Next to the political and religious bearing of the recent Education Act, its provisions with reference to the introduction of manual work into ordinary elementary schools, and for the encouragement of higher elementary and trade instruction, attract most attention.

Technical Education.—On the 13th of March, 1880, the Prefect of the Seine appointed a Commission of Inspection in connection with the Municipal Apprenticeship School of the Boulevard de la Villette. The commission was composed of gentlemen whose authority on questions of technical education is undeniable. After seven months service they submitted a report. In this they take the ground that opposition to the forma-

tion of apprenticeship schools arises from ignorance or the spirit of routine. They emphasize the opinion that practical instruction, to be in earnest, cannot be independent of actual production; and they insist that apprentices of the third, and even of the second year, should, as far as possible, turn out objects that are of use.

A second sub-commission appointed by the Prefect of the Seine to report upon the establishment of apprenticeship schools in general, recommends that three apprenticeship schools for boys should be established in Paris for what are termed "parent industries." In addition a school for girls is recommended, which shall be not only an apprenticeship school but also one of domestic economy. Drawing is an important feature of the program proposed for all of these schools.

Physical Training.—Gymnastics is included in the program of primary education.

Rural Schools.—In all countries the condition of schools in the rural districts is becoming more and more the subject of attention. Mr. Ferry, in a letter of April 3d, calls the attention of the Prefects of the Departments of Moobihan and Vendée to evidences of ignorance in those districts. In the former 60 per cent. of the conscripts for the army, and the same proportion of persons presenting themselves at the *mairies* for marriage, cannot read nor write. In the latter 40 per cent. of the conscripts are illiterate. The villages in these departments are widely separated, and the schools so situated that hundreds of children must travel eight or ten miles daily to attend them. A number of communes in the two departments have voted appropriations to increase the number of schools, and the Minister of Public Instruction offers in addition subsidies of 600,000 and 1,000,000 francs.

PRUSSIA.—*Secondary Schools.*—The Prussian Minister of Public Instruction has prepared new plans of study for all classes of secondary institutions. Peculiar interest attaches to this action on account of the existing controversy with reference to classical and non-classical courses.

The institutions affected are: (1) Gymnasia, classical schools preparing for the University; (2) Real-gymnasia, secondary schools preparing for higher technical schools and for the faculties of philosophy in the universities; (3) Ober-Real-schules, non-classical secondary schools preparing for technical and commercial schools; (4) Higher burgher-schools, secondary schools preparing for industrial, lower technical, and commercial schools.

Gymnasia, Real-gymnasia, and Ober-Real-schules have each nine classes. Higher burgher-schools have six. The new programs have been made obligatory for the three lower classes from the beginning of the present school-year (Easter, 1882); they do not go into operation in the remaining classes until Easter, 1883. The character which it is proposed to impress upon these various institutions will be seen if we take the program for the Gymnasia and point out the differences between it and the others. For the Gymnasia the subjects of instruction are: Religion, German, Latin, Greek,

French, history and geography, arithmetic and mathematics, natural history, physics, penmanship, drawing. In the course for Real-gymnasia, Greek is omitted and English and chemistry introduced. In the course for the Ober-Real-schule Latin and Greek are both omitted, and English and chemistry introduced. In the course for the higher burgher-schools, Latin, Greek, and physics are omitted, and English and natural philosophy introduced. The number of hours per week allowed for French, arithmetic and mathematics, and physics is greater in the Real-gymnasia than in the Gymnasia, and the number allowed for Latin, less. In the Ober-Real-schules the time allowed for French, mathematics, and physics is longer than the same in either of the preceding classes, and the time for English longer than in the Real-gymnasia. In the higher burgher-schools more time is allowed for penmanship and natural history than in the other classes of institutions.

The Budget.—The Prussian educational budget for 1882–83 calls for an appropriation of 45,835,426 marks. Of this sum 20,053,849 marks are for elementary schools; 4,582,830 marks for secondary schools, and 5,913,224 marks for subsidies to universities.

NETHERLANDS.—The report of the Minister of Education for the Netherlands, just received at the Bureau of Education, presents the condition of education for 1880–81. Superior education is provided in three State universities,—Leyden, Utrecht, and Groningen,—and one municipal university at Amsterdam. The total of the students in the three former is 1190, in the latter 343. For secondary education there are 24 gymnasia and 5 progymnasia, with 316 professors and 1,730 students; 57 higher burgher-schools, with 4,182 students, and 12 high schools for girls, with 929 students. The Agricultural School at Wageningen numbers 41 male and 10 female students. The Royal Polytechnic School has 362 students, 12 of whom are females. There are 11 naval schools. The total number of primary schools is 3,880; viz., 2,575 ungraded and 1,305 graded. Of these 2,771 are public schools, and 99 private schools receiving subsidies. The number of teachers is 10,313, and the number of pupils 544,559. This leaves 27,300 children between the ages of six and twelve who do not attend school. For the training of teachers there are seven State normal schools. The total government expenditure for primary education for the year (1880–81) is given as 2,377,295 florins.

GERMANY.—*Primary Education.*—Since the recent publication of the estimates for education, the government has demanded the creation of a new division which will be specially devoted to primary instruction. The Commission of the Budget has resisted the proposition on account of the increased expense which it imposes, but it is regarded as probable that the Landstag will accord what the commission refused.

SCIENCE.

PROF. LIONEL S. BEALE, the distinguished microscopist, in a recent lecture on "Modern Scientific Thought" says: "I would draw attention to the declaration again and again repeated, and now taught even to children, that the living and non-living differ only in degree; that the living has been evolved by degrees from the non-living, and the latter passes by gradations toward the former state. No one has produced any evidence in proof of these conclusions, which are, in fact, dictatorial assertions only; and no specimen of any kind of matter which is actually passing from the non-living to the living state, or which can be shown to establish any connection between these absolutely different conditions of matter, has been or can be at this time brought forward. It is not only one or two of the positions assumed by the materialist that are open to doubt or objection. Facts completely controvert all materialistic views which have been brought forward." . . . . Referring to nature as explained by the materialist, he says: "A nature which was really a blind, insatiable, irresistible fate, falsely called law, destitute of intelligence and reason, devoid of mercy and justice, is the nature held up for our admiration with the consoling assurance of dictatorial authority that it sprang from chaos in obedience to everlasting self-originating (?) law, and that it will return to chaos, in obedience to the same, — all life, all work, and thought being but the undulations of cosmic nebulosity, and dependent upon the never-ceasing gyrations of infinite, everlasting atoms, as they bound through the ages from void to void. I believe all materialistic doctrines, vary as they may in detail, will be found to agree in accepting as a truth the monstrous assumption that the living and non-living are one, as a watch or wind-mill. Surely this is the dullest, the narrowest, the most superficial of all creeds."

Before the Royal Horticultural Society, April 25, the topic was "Fertilization of Hoya." Mr. W. G. Smith exhibited flowers with flies attached to the glutinous disks of the pollen-masses. The highly fragrant Hoya is very attractive to insects which are necessary for the fertilization of this plant. The pollinia are concealed, with the exception of dark viscid disks. When an insect alights on the flowers, at least one foot is caught by one of the fine glutinous disks. In its effort to escape two or three, or even four other feet are almost sure to get similarly caught. The insect thus tries with all its power to free its limbs. If successful the pollen-masses are withdrawn out of the pouches by the feet. The basal appendages of each pair of pollinia are elastic, and while in the pouch they are extended like a spring, but the instant the masses are withdrawn the spring closes and the two masses quickly cross each other and tightly hold the insect's claws. If the insect is weak it cannot withdraw its legs, and so perishes on the flower; but if strong, it flies away with one to five pairs of pollinia clasped

around its feet. Sometimes an insect breaks part of its leg off in trying to escape. The five stigmas are not ready to receive the pollen at the time it is mature, therefore it is only when the insect re-alights on some neighboring Hoya-flower in a more advanced stage of growth, that cross-fertilization takes place by its treading upon exposed stigmas.

RESEARCHES ON OZONE: *M. Mailfert.*—It is already known that sulphur is converted into sulphuric acid by ozone. If both are perfectly dry, no sulphuric acid is produced; but if the reaction takes place in the presence of water, sulphuric acid is obtained. If an alkali is present, a sulphate is formed. With selenium and tellurium, in the presence of water, ozone likewise gives selenic and telluric acids. Neither selenious nor tellurious acid is formed. Most, if not all, sulphides are attacked more or less rapidly by ozone. The sulphides of copper, antimony, zinc, and cadmium, as well as the alkaline and alkaline-earthy sulphides, yield sulphates. Nickle and cobalt sulphides are first converted into sulphates, but on continuing the reaction there is a formation of peroxides, and a part of the sulphuric acid is set free. Gold sulphuride gives a precipitate of metallic gold and sulphuric acid. Platinum, silver, and bismuth sulphides likewise give free sulphuric acid. Mercury sulphides are only slowly attacked by ozone. Manganese, palladium, and lead sulphides are converted into peroxides, and all the sulphur into free sulphuric acid.

Formene and ethylene are converted into carbonic, formic and acetic acids. Acetylene yields carbonic and formic acids, but not acetic acid. Amylene gives carbonic, butyric, and valerianic acids. The formic and and acetic acids, if present at all, are found in small proportions. Benzol and toluol yield carbonic, formic, acetic, and probably other acids of the fatty series. Benzol gives a dark brown solid, and toluol a brown syrupy liquid.

PROF. PIAZZI SMYTH, astronomer-royal for Scotland, read a paper on some points in the meteorology of Madeira, both absolute and comparative. By a careful comparison of the mean monthly temperature, and the mean daily range, during the months of June and July at Madeira and Lisbon, it appeared that the temperature at the former was markedly more equable. A like comparison was also instituted for the corresponding annual variations at Madeira, Lisbon, Jerusalem and Scotland, and the same wonderful equableness was shown to exist. Observations with the wet and dry bulb thermometer, and of the "rain-band," proved the climate of Madeira to be at the same time remarkably humid, which at once explains its cold summers and warm winters. This striking humidity the author traced to the influence of the gulf stream, a branch of which trends south from the Bay of Biscay past the coast of Portugal.

That the ocean-waters around Madeira are peculiarly warm was demonstrated by the late Sir Wyville Thompson in the "Challenger" expedition.

The abundant presence of watery vapor in the atmosphere also seems to have a marked influence upon the flora and fauna, which are very different rom what would be expected when latitude alone is considered. — *Royal Society of Edinburgh.*

PROF. BRUCKE has constructed an artificial blue sky by dropping a spirituous solution of rosin into water until the liquid becomes turbid and milky. When a blackboard is placed behind the glass containing this turbid solution, and light is thrown upon the liquid obliquely from above, it assumes the aspect of a clear, blue sky. Prof. Helmholtz, very unpoetically and almost irreverently, speaks of a blue eye as simply an eye with turbid humors. Prof. Tyndall, in following up these investigations, shows that an artificial blue sky may be produced by throwing a strong beam of light upon certain kinds of gases contained in long glass tubes. One portion of the gas is suddenly precipitated as a delicate cloud capable of reflecting the blue waves. The reflected light is polarized in a direction perpendicular to the path of the illuminating beam.

DATA continue to be accumulated, showing more definitely that there exists a close connection between the structure of molecules and the physical properties of the substances composed of these molecules. Pawlewski has recently published a short account of his researches on the "critical temperatures" of liquid compounds. He states that the critical temperatures of isomeric ethers are identical, or very nearly so ; that isomers containing doubly-linked carbon atoms have a higher critical temperature than those in the molecules of which carbon is singly linked. — *Berichte*, xv., 460.

A SIMPLE barometer may be made of a glass tube about 7 inches long, and about two-thirds of an inch in diameter. Heat one end and draw it out to a point, leaving an orifice about $\frac{1}{100}$ to $\frac{1}{60}$ of an inch in diameter. Fill the tube about half full of distilled water and cork the top with rubber. Low barometer, and rain, is indicated by a drop of water hanging to the end of the tube. When the barometric pressure rises the drop disappears, and a bubble of air may sometimes be seen entering the narrow opening.

IN continuance of his experiments on the effect of pressure on chemical changes, Spring states that he has prepared Wood's alloy (melting at 65°) by compressing at 75,000 atmospheres, iron-filings, bismuth, cadmium, and tin, in proper proportions. He has also obtained Rose's alloy (lead, bismuth, and tin), and also brass, by pressure of the constituent metals. — *Berichte*, xv., 595.

NO mineral has any effect npon the tubercle-bacillæ discovered by Dr. Koch, the ectoderm being impenetrable by sulphuric or nitric acid. Alkaline solutions, however, soon become diffused throughout the interior of

these parasites and rapidly destroy them, — a fact that may prove of great practical importance in the treatment of consumption.

ALTHOUGH W. P. Wilson employed methods of analysis which would detect one-tenth milligramme of carbonic acid, there was not discovered a measurable difference in the amount of carbonic-acid gas given off in the respiration of plants exposed to light or kept in the dark, in ordinary air, or in hydrogen gas.

As the result of an extended series of observations on the structure of metals, Kalischer (Berichte, xv., 702) concludes that most of the metals are naturally crystalline, and that when the crystalline structure has been lost by mechanical treatment it can, in most cases, be restored by the action of heat.

DR. C. SETTERBERG has prepared metallic cæsium by electrolysis of cyanide of cæsium and barium. The metal is silver-white, very soft, ductile, specific gravity 1.88, melts at 29.5 C. Takes fire spontaneously in the air, and if thrown upon water burns like potassium and verbidium.

VERY small insects may be preserved by fastening them with gum to thin microscopic-slide covers; and then fastening the cover to a piece of cardboard supported by a pin. The upper and under sides of the specimen can then be examined.

MM. HAUTEFEUILLE and Chapin claim that by compressing, at 125 atmospheres, a mixture of oxygen and ozone in a bent tube, which was cooled by a jet of ethylene, they obtained ozone in liquid drops of a dark indigo-blue color.

THE electric light affects the colors of cloths as well as paintings in the same way, but not so quickly, as sunlight.

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